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# Tumour of Wagner-Meissner touch corpuscles *

## Wagner-Meissner neurilemmoma

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**Summary.** Two benign tumours composed mainly or exclusively of Wagner-Meissner corpuscles are described. In the first case the touch corpuscles are composed of closely piled laminar cells and surrounded by argyrophilic fibres. In the second case some Schwann cells are observed in between the tactile corpuscles. The light microscopic, electron-microscopic and immunohistochemical results demonstrate that these corpuscles are comparable with the tactile end organs of the skin. Immunohistochemically, neuron-specific enolase, vimentin and protein S-100 could be demonstrated in the tactile corpuscles.Neural processes present in normal Meissner corpuscles are absent and immunohistochemically no nerve fibres or nerve endings can be demonstrated using antibodies to neurofilaments as they are observed in normal touch corpuscles of the skin.

Tumours which consist mainly of multiple touch corpuscles have not been described in the literature. It is suggested to call these tumours Wagner-Meissner neurilemmoma.

**Key words:** Tactile receptors – Tumours of peripheral nerves – Neuron-specific enolase – Immunohistochemistry – Electron-microscopy

## Introduction

The Wagner-Meissner corpuscles are the touch receptors of the skin. They are located in dermal papillae, especially on the palmar and plantar surface. They occur frequently in persons who have neurofibromas or neurinomas (Brögli 1931; Jordan 1933; Scherer 1934; Dible 1963; Masson 1970; Ashley 1978; Enzinger and Weiss 1983), and they have been reported together with traumatic neuromas (Masson 1945; Hill 1951; Shapiro et al. 1973). Meissner corpuscles or structures resembling them (Meissneroid corpuscles

* Dedicated to Professor Dr. Dr. h.c. K. Lennert in honor of his 65th birthday

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or pseudo-Meissner corpuscles) are also seen in cellular nevi (Jordan 1933; Lund and Strobbe 1944; Ashley 1978).

In the cases reported to date the tactile corpuscles have been merely part of an otherwise different tumour, that is to say that the presence of tactile corpuscles is only an accessory finding in the diagnosis of neurofibroma or cellular nevus. In the present study a tumour will be described which consists mainly of multiple Wagner-Meissner corpuscles.

## Materials and methods

Three tumours were investigated. All of them were excised under local anaesthesia.

*Case 1.* An 80-year-old man consulted his doctor with a painless tumour of 1 cm in diameter in the skin of the left thigh.

*Case 2.* In a 33-year-old man a 2 cm large tumour was located on the leg.

*Case 3.* This case was chosen for comparative reasons. Clinically an exophytically growing tumour of 0.8 cm diameter was present on the forehead of a 49-year-old woman.

The tissue was fixed in 10% formalin and the slides were stained with haematoxilin eosin (H & E), Giemsa, periodic acid-Schiff (PAS), and Bielschowsky's reticulin stain. The following antigens were localized with the peroxidase-antiperoxidase method (PAP) of Sternberger et al. (1970): neuron-specific enolase (NSE), protein S-100, vimentin, and neurofilaments. The sections were deparaffinized with xylol and rehydrated with ethanol. The endogenous peroxidase-activity was blocked with methanol hydrogen peroxide. After buffering with phosphate and adding normal swine-serum, the sections were incubated with primary antibodies, each diluted in 5% swine serum: NSE 1:300, protein S-100 (Dakopatts, Hamburg, FRG) 1:100, vimentin (Laboserv, Giessen, FRG) 1:10.

The next step was the application of the secondary antibody (swine-anti-rabbit-immunoglobulin), followed by incubation with peroxidase-anti-peroxidase complex (PAP, Dakopatts, Hamburg, FRG).

Neurofilament antibody (Laboserv, Giessen, FRG) was used in a dilution of 1:10 and followed by an incubation with peroxidase conjugated rabbit-anti-mouse immunoglobulin. As a negative control the primary antibody was omitted.

For the electronmicroscopic examination in case 1 the formalin fixed and paraffin embedded material was deparaffinized with xylol, rehydrated, post fixed in 1% osmium tetroxide and embedded in araldite. Sections were stained with uranyl acetate and lead citrate and examined with a Siemens Elmiskop I.

## Results

### *Light microscopic findings*

The tumours were oval and were situated in the lower part of the dermis and the subcutaneous fat. Both tumours were well demarcated and encapsulated by concentric collagenous fibres (Figs. 1 and 4).

The tumour in Case 1 contained multiple adjacent cell complexes (Fig. 2), which were reminiscent of Meissner touch receptors of the skin, each composed of 5–20 laminar cells. The characteristic feature was the lamelated pattern of these corpuscles. The nuclei of the laminar cells were located at the periphery of the corpuscles or they were arranged transversely to the long axis of these structures along the lamellae. The nuclei were

**Fig. 1.** The monomorphous picture of the tumour encapsulated by collagen fibres (Case 1). H & E, × 56

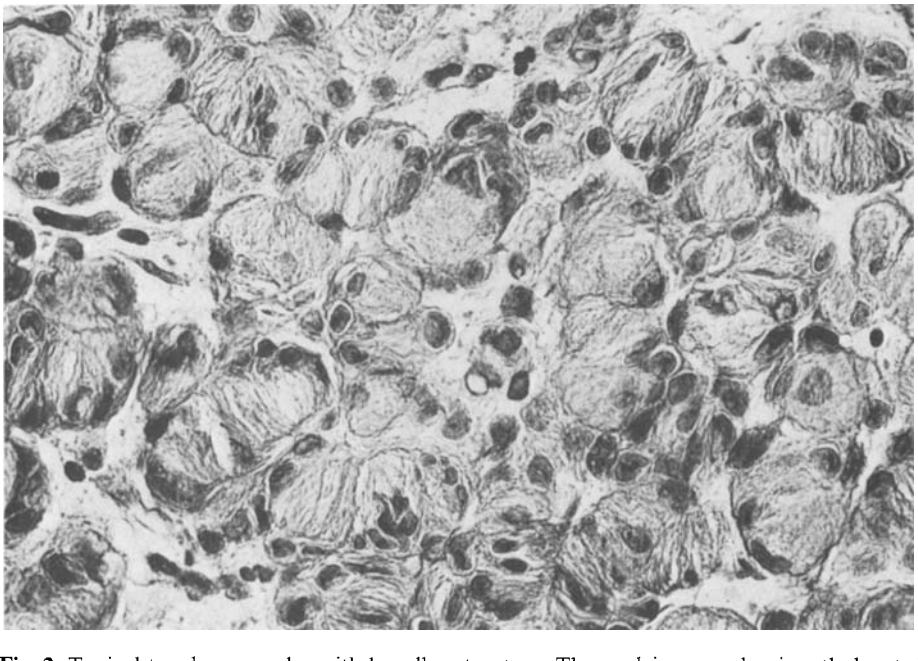

**Fig. 2.** Typical touch corpuscles with lamellar structure. The nuclei are predominantly located at the periphery of the corpuscles (Case 1). H & E, × 560

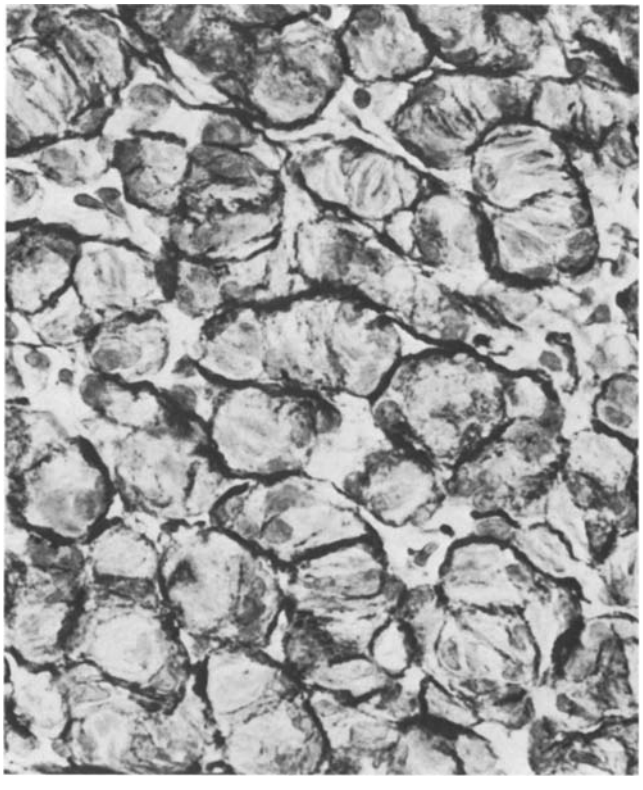

**Fig. 3.** After silver staining it can be seen that each tactile corpuscle is surrounded by argyrophilic fibres (Case 1). H & E, × 560

oval or showed one or several nuclear invaginations. The chromatin was spread homogeneously over the nucleus. The nucleus was small. Mitoses were not observed. The cell complexes were encapsulated by concentrically arranged argyrophilic fibres (Fig. 3) which gave, when the corpuscles were densely packed, the impression of a paving stone construction.

The second tumour (Figs. 4 and 5) showed a picture somewhat different from the first one. The corpuscles were faintly discernible as such, but had the same build-up. Partly the corpuscles consisted of only two or three cells and partly the small lobules seemed to merge into larger units (Fig. 4). The tissue in between and surrounding the lobules contained small vessels, some fibroblast-like cells and many mast cells. Nerve bundles were not seen. While in the first tumour Schwann cells were completely absent they could be observed sparsely in the second one. These cells (Fig. 5), located in the vicinity of the touch corpuscles, showed oval or spindle shaped nuclei, a perinuclear clear area and elongated cytoplasmic protrusions. The protrusions were arranged in a parallel way to each other in concentric lamellae.

In the third case one found in the skin biopsy an intradermal cellular nevus with typical Wagner-Meissner tactile end organs. They were located in the upper and mid dermis and sometimes with direct contact to the covering epidermis.

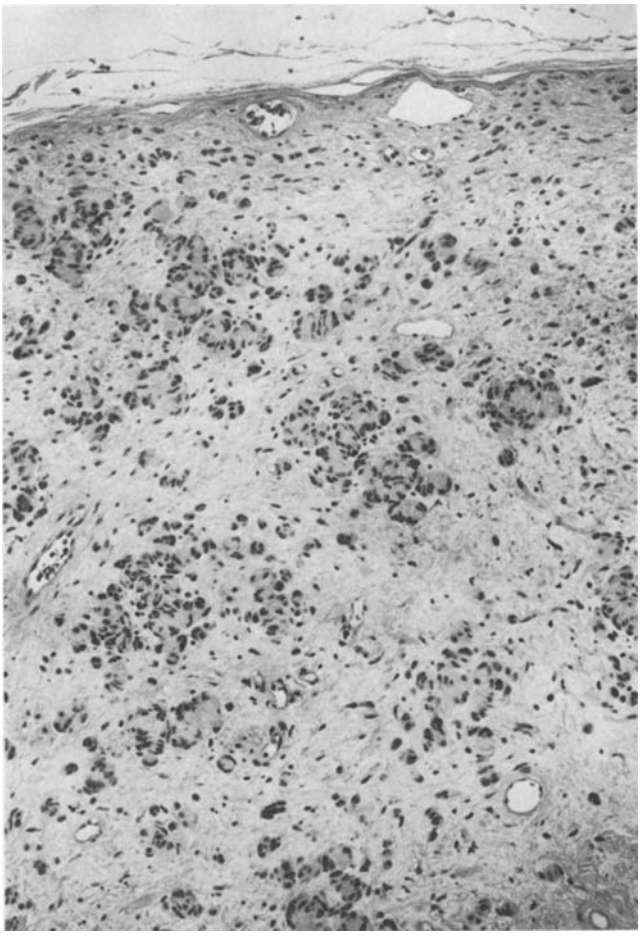

**Fig. 4.** Encapsulated tumour nodule with sparsely separated or piled tactile corpuscles. The interstitial tissue is loose and poor on cells (Case 2). H & E, ×140

*Electronmicroscopic findings (Case 1)*

The Meissner corpuscles were composed of laminar cells with thin cytoplasmic laminae stretching across the organs in irregular layers. The nuclei of the laminar cells were excentric at the periphery of the corpuscles (Fig. 6). The cytoplasm formed many protrusions or invaginations which connect with one another forming a labyrinth. These cytoplasmic protrusions touched the opposite side of the corpuscles. In the cytoplasm the mitochondria were numerous but other noteworthy cell organels were not observed, apart from some short fragments of rough endoplasmic reticulum. Some cells contained many polyribosomes besides mono-ribosomes. The nucleus was bizarre, often elongated or segmented. The heterochromatin was regularly distributed over the nucleus, the nucleolus was small and located in the center or at the periphery.

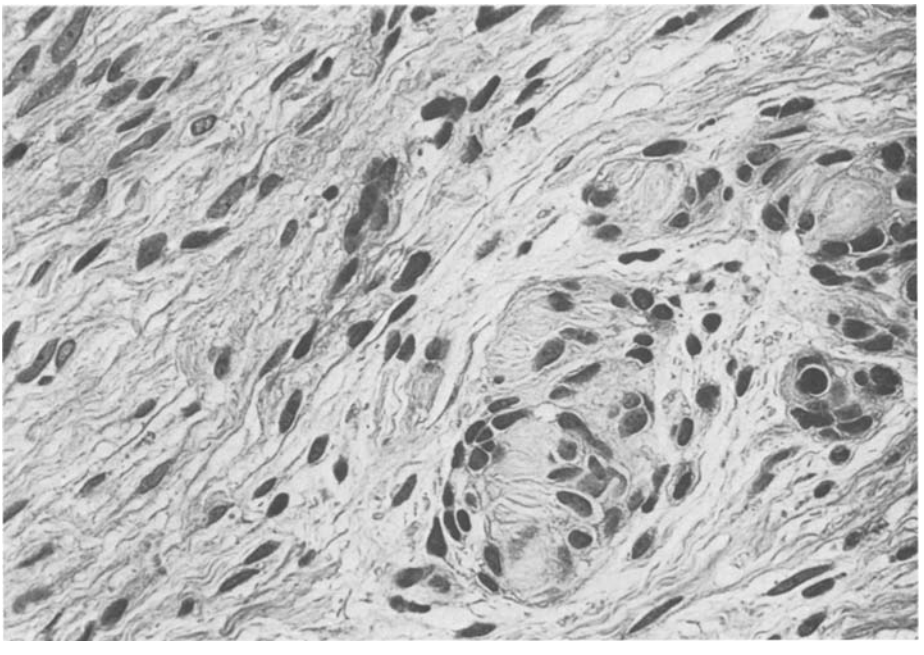

**Fig. 5.** Several touch corpuscles and Schwann cells arranged in parallel (left part) (Case 2). H & E, × 560

Nerve fibres or nerve endings were not observed in or around the corpuscles. Collagen fibres surrounded the touch corpuscles lying partly in an amorphous matrix.

*Immunohistochemical findings*

The immunohistochemical reactions were almost the same in Cases 1 and 2. The tactile corpuscles showed an intensively positive reaction for protein S-100, vimentin, and a moderate reaction for NSE.

Protein S-100 could be detected in the nucleus and in the cytoplasm. Using antibodies to vimentin the reaction showed a strong granular pattern all over the cytoplasm. The cytoplasm showed a diffuse granular reaction for NSE. The spindle shaped cells (Schwann cells) which were seen around the corpuscles in case 2 reacted positively for protein S-100, NSE, and vimentin.

Some spindle shaped cells (fibroblasts) in the vicinity of the corpuscles were negative for protein S-100 and NSE but were strongly positive for vimentin.

Neurofilaments did not give any positive reaction, neither in the touch corpuscles nor in the surroundings or in the tumour capsule.

In the skin biopsy of the intradermal cellular nevus there was a positive reaction for protein S-100, NSE, and vimentin. Some touch corpuscles had

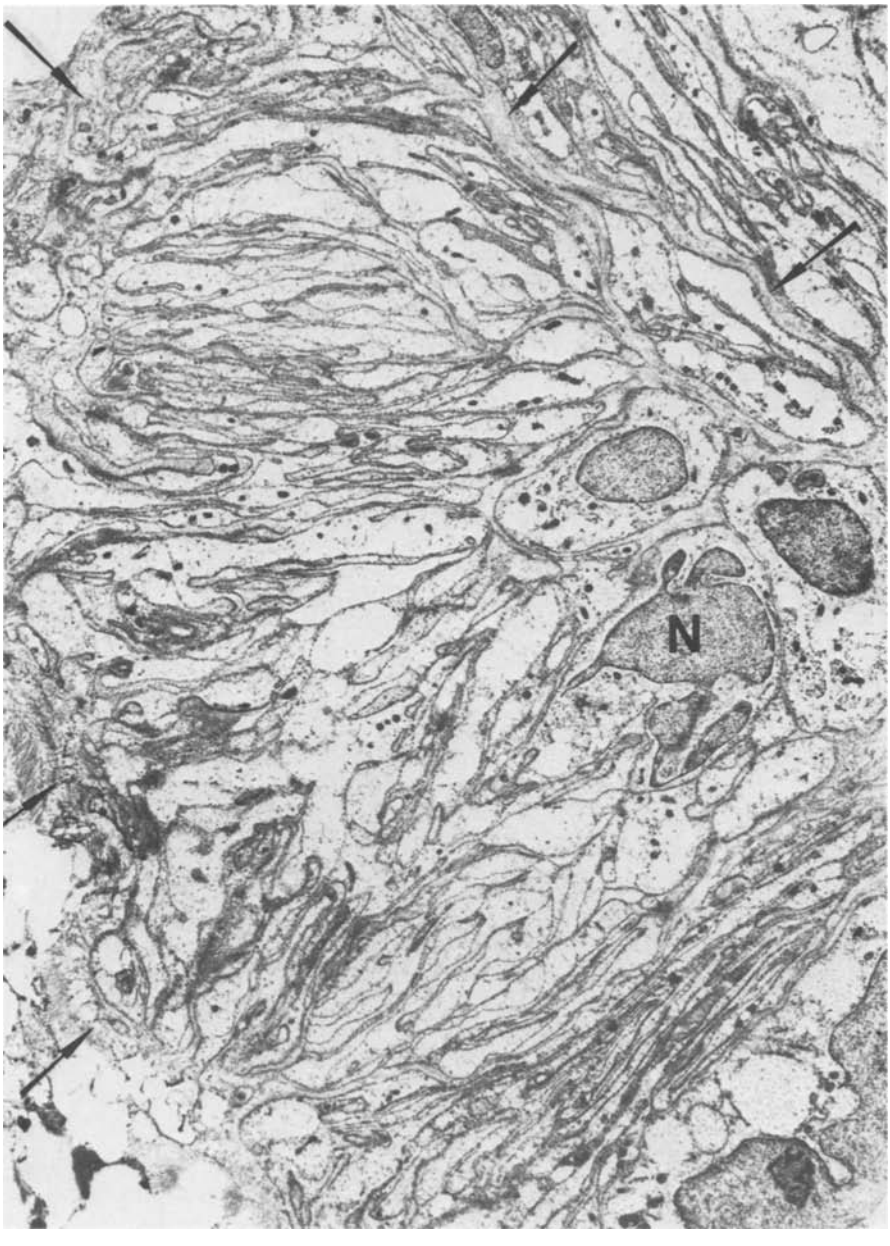


**Fig. 6.** Laminar cells with excentrically located nuclei (N). The cytoplasmic protrusions are stretched across the corpuscles in irregular layers. No axons are observed. The corpuscle is surrounded by collagen fibres (*arrows*) (Case 1). × 11,500

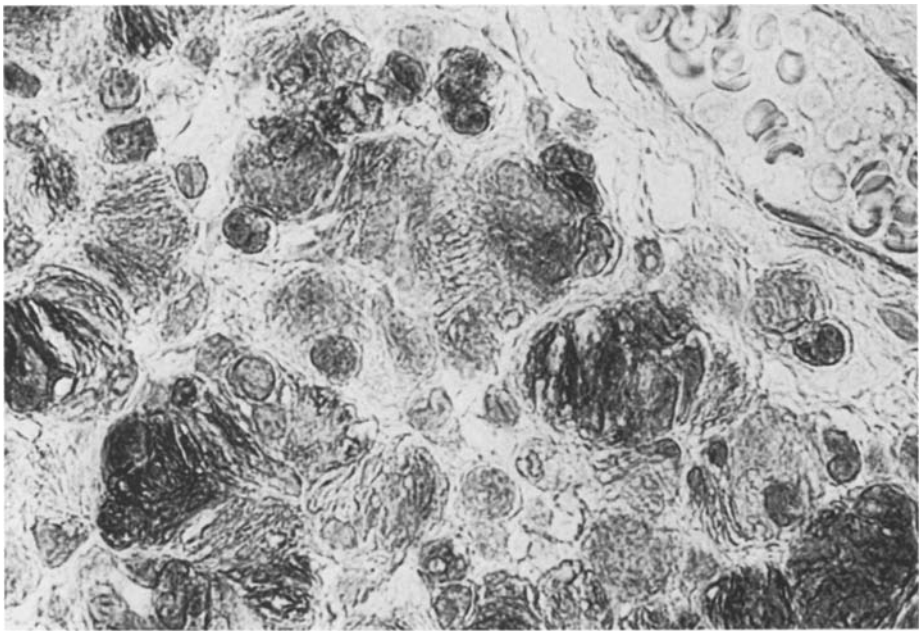

**Fig. 7.** The tactile corpuscles show a positive reaction for protein S-100 (Case 1). PAP, ×880

neurofilament-positive, wormlike and clubbed structures. Neurofilament-positive nerve fibres were also observed in the vicinity of the tactile corpuscles and around the nevus cells.

## Discussion

In human pathology the touch corpuscles are only significant when they are observed in association with other tumours. In such cases they have differential diagnostic importance. The presence of Meissner bodies (and also of Vater-Pacini corpuscles) points to the neural origin of the tumour, especially for a neurinoma, a neurofibroma or a neuroma. In the difficult differential diagnosis between diffuse neurofibroma and dermatofibrosarcoma protuberans, the presence of Meissner bodies can point to the diagnosis of neurofibroma (Enzinger and Weiss 1983).

In the literature the touch corpuscles are reported to occur in peripheral neural tumours and they have been described only in benign tumours. But it would not be amazing if malignant neural tumours should contain touch corpuscles[1] since Meissner bodies are often found in Recklinghausen's disease (Jordan 1933; Scherer 1934; Mikuz and Probst 1972 and others) and a malignant degeneration in primary benign tumours is not infrequent.

[1] We have since seen (in collaboration with Prof. Dr. Dr. F. Härle, Department of Oral Surgery, University of Kiel), a neurofibrosarcoma with Wagner-Meissner bodies (unrelated to Recklinghausen's disease) in a 53-year-old woman with a tumor in the fossa infraorbitalis

The Vater-Pacini corpuscles mediate the sense of pressure and occur not only in the skin but for example also in the mesentery. They appear more rarely in neural tumours than Meissner bodies. Frequently both are seen together in one tumour. In one reported case the individual corpuscles even showed a combination of a Pacini exterior and a Meissner interior (Schochet and Barrett 1974). The so-called Pacinian neurofibroma is a tumour in which the Pacini corpuscles are numerous. In this rare benign tumour, first described by Thoma (1894) and later by Prichard and Custer (1952), and by Prose et al. (1957), the Pacini corpuscles have the typical onion ring configuration. This tumour also contains Schwann cells (Weiser 1975) which give it the appearance of a neurilemmoma. Comparing the cases of Pacini neurofibroma reported in the literature with our second case an equivalent lesion can be discerned. As described above the tumour consists of multiple Meissner corpuscles and of Schwann cells and for this reason, can be considered to be Wagner-Meissner neurilemmoma. The first tumour resembles the second but can be differentiated by the close packing of Meissner corpuscles and by the absence or indistinguishability of Schwann cells, thus it can only be characterized as a tumour of the Wagner-Meissner corpuscles. Since, however, the laminar cells which compose the Meissner organs are closely related to the Schwann cells and can probably be considered as a modified form (Hashimoto 1973) this tumour can also be called a Wagner-Meissner neurilemmoma.

According to our immunohistochemical findings the normal touch corpuscles and the corpuscles in the intradermal cellular nevus react positively for protein S-100, vimentin, and weakly positive for NSE. This pattern is the same as in the tactile corpuscles in both Wagner-Meissner neurilemmomas. Moreover the laminar cells, with their positive reaction for protein S-100 and vimentin, react as normal Schwann cells or as Schwann cells observed in neurilemmoma and neurofibroma. This sustains the opinion of Hashimoto (1973) that laminar cells are modified Schwann cells.

It is noteworthy that the touch corpuscles of the skin and the accumulated corpuscles are NSE positive. Occasionally Schwannoma is also NSE positive (Vinores et al. 1984). These results are in favour of the Schwann-cell-origin hypothesis of the tactile corpuscles, but their neural origin cannot be confirmed since neural components have not been demonstrated in the neoplastic corpuscles. In contrast to normal touch corpuscles (Cauna and Ross 1960) no nerve fibres nor nerve endings were observed electronmicroscopically and no such structures were demonstrated with the antibody to neurofilaments.

Nevertheless, some touch corpuscles in the vicinity of the intradermal cellular nevus show nerve bundles. With this absence of nerve fibres or nerve endings it is not surprising that the Wagner-Meissner neurilemmoma is quite indolent.

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