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# PIGMENTED JAW TUMOR IN AN INFANT
# A MELANOCYTOMA

*by*

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## INTRODUCTION

The origin and nature of the melanin-producing cells have for many years been a matter of controversy. The modern view now commonly accepted is that the melaninproducing cells originate in the neural crest and migrate in early fetal life to their final place of destination, where they are found as melanocytes. Only these cells have the ability of producing melanin. The pigment may later be transferred to other cells, e.g. epithelial cells, nerve cells, macrophages (melanophores).

The melanoblasts migrating from the neural crest tend to grow towards surfaces or borders. This tendency is more clearly demonstrated in lower vertebrates, where melanocytes line not only the epithelial cover of skin and mucous membranes, but also the surfaces of serous cavities, meninges, nerve sheats and blood vessels.

Sometimes the migrating cells fail to reach their destination, and groups of melanocytes (nevus cells) may be misplaced, e.g. deep in the dermis, and remain there throughout the life. The melanocytes located in the basal layers of the epidermis are stellate or dendritic cells. The melanocytes found in the dermis or the submucous tissue (intradermal nevus) are as rule round or ovoid cells arranged in spherical clusters. In deeper localizations (»blue nevus») the cells may be elongated and spindleshaped, and arranged in strands or whorls which taper off into the surrounding tissue. In spite of

the wide range of morphology, all these cells are of the same origin, derived from the neural crest, and the different forms of nevi and melanomas are regarded as developmental disturbances or tumor formations of the melanocytes.

In benign tumors arising from these cells (nevus cell tumors) there is a certain cellular pleomorphism of small cells intermingled with large ones, pale as well as deeply stained nuclei, and even multinucleated cells. In malignant melanomas this pleomorphism often is more pronounced, and mitotic figures are present, sometimes in great numbers. The so-called juvenile melanoma is a nevus cell tumor arising in children, with a histologic picture closely resembling that of an invasive malignant melanoma. Clinically these tumors are benign. Prior to puberty, malignant metastazing melanomas are extremely rare.

The vast majority of the nevus cell tumors — benign and malignant — occurs on the skin. Such tumors are also found on the mucous membranes — e.g. in the oral cavity, in the esophagus, in the vagina — and in the central nervous system. In the last location the primary malignant melanoma is a rare tumor. Melaninproducing cells are, however, often found in tumors arising from nervous tissue, e.g. melanin-pigmented neurofibroma, or pigmented meningeoma.

The pigmented jaw tumor of infants to be discussed in this paper is a rare growth. Nearly 50 cases have hitherto been reported. *Dahlbäck* and *Thilander* (1964) have collected 35 cases (strictly spoken only 34, as Lurie's case should be omitted — see below —) and *Kerr* and *Pullon* (1964) have reported 36 cases, 6 of which were not included in Dahlbäck and Thilander's list. To this number of 40 must be added at least one case reported by *Pontius, Dziabis* and *Foster* (1965), one by *Husted* and *Pindborg* (1965), one by *Held* (1965), one by *Williams* (1967) and one in the present paper.

## CASE REPORT

A boy at the age of one and a half months was taken to a surgeon because of a slight cystic prominence in the alveolar ridge of the right maxilla. The cyst contained a small tooth crown, which was removed. A month later the prominence had increased and a biopsy was taken. This was, however, not representative, and was misinterpreted. From now on the swelling increased rapidly. At the age of three months the child was hospitalized. At his time the total right maxilla was involved in a neoplastic mass which protruded out of the mouth and could be felt up to the lower orbital margin.

A biopsy revealed heavily pigmented tumor tissue, and the diagnosis

melanotic jaw tumor was established. However, the tumor had invaded the surrounding tissue to such extent that operative surgery could not be performed. Radiological treatment was also deemed unadvisable. The tumor continued to grow up to monstrous dimensions, and the child died one month later — at the age of four months.

A post-mortem examination* showed a pigmented tumor that included the right maxilla up to the orbita, had closed the right nasal cavity and caused deviation to the left of the septum, and protruded out of the mouth the size of a small orange. The tumor was partly encapsulated and could with some difficulty be detached from the surrounding tissue.

Tumor tissue had replaced part of the orbital floor, but was distinctly separated from the content of the orbita. No connection with the retina could be traced. Both eyes were normal, as well as the rest of the head. No metastases were found, and no peculiar pigmentation in any part of the body. In the stomach the muscular layers were missing in an area of about one square inch, the wall consisting of mucosa and serosa. No other anomalies were found.

The tumor weighed 160 g. X-ray examination revealed several partly calcified tooth germs and a system of radiating bone trabeculae. The histological examination revealed the same picture as is described in most of the formerly reported cases. Large, heavily pigmented cells lay in clusters or lined slitlike or oval lumina, resembling pigmented epithelium. Silver staining a.m. Gomori, however, revealed argentophilic fibrils in the cell clusters, thus ruling out the epithelial nature of these cells. Further, groups of small cells with dark nuclei and scanty cytoplasm were found. These cells to some extent resembled lymphocytes, but were larger, and some of the nuclei were slightly elongated. There were also small islands of partly keratinized epithelium, obviously not participating in the tumor formation.

The tumor tissue had invaded and to some extent destroyed the soft parts of the tooth germs, but there were no signs of the odontogenic tissue being part of the tumor.

Generally the epithelium of the oral mucosa was separated from the tumor by a connective tissue. In a few places the pigmented tumor tissue made contact with the covering epithelium. Here pigmented or clear cells could be found in the basal layer of the epithelium, in the same way as the cellular arrangement in a junctional nevus. The radiating network of bone trabecula found in X-ray examination consisted of newly formed bone with a zone of osteoid tissue lined by a row of osteoblasts.

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* This examination was performed by the present author at The Norwegian Radium Hospital.

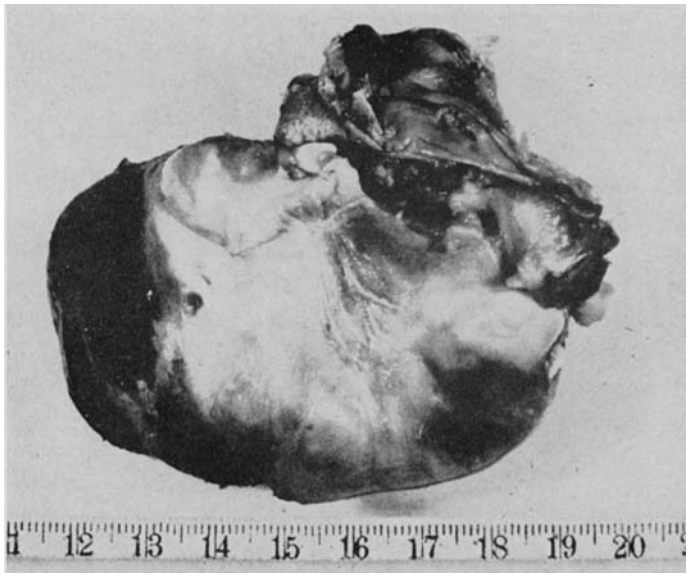


Fig. 1. Tumor *in toto*, pigmented and encapsulated.

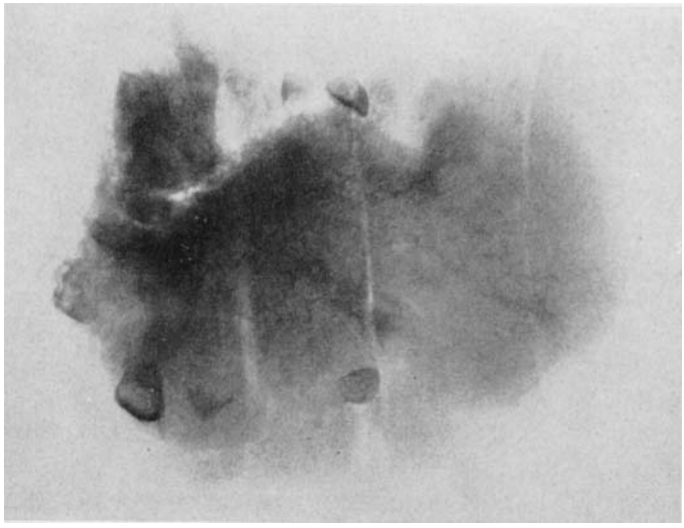

Fig. 2. X-ray picture (positive) of tumor, showing the derangement of the tooth germs and the radiating bone trabeculae.

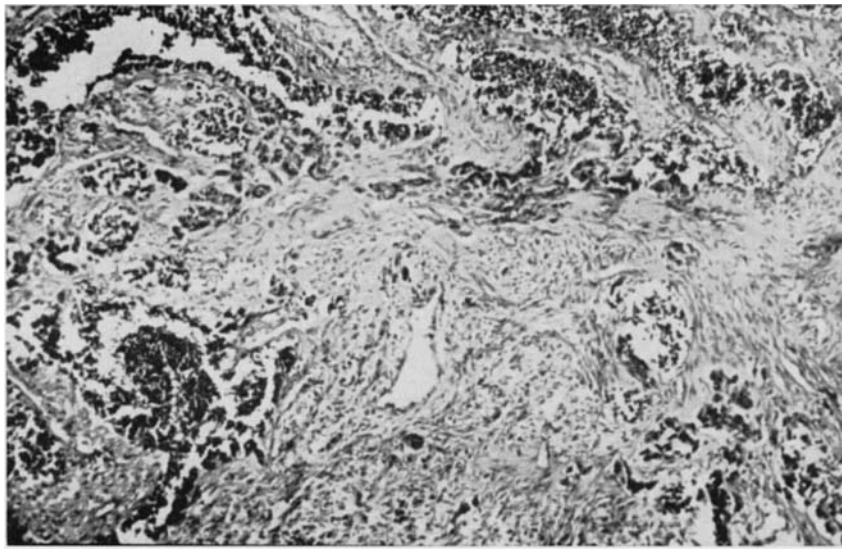

Fig. 3. Pigmented tumor tissue lining irregular slits. (× 200).

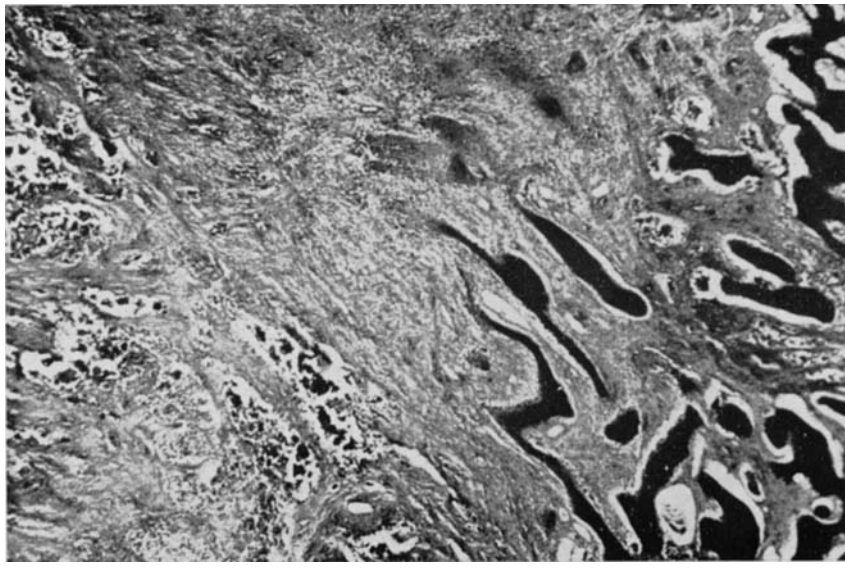

Fig. 4. Newly formed bone trabeculae in tumor tissue. (× 200).

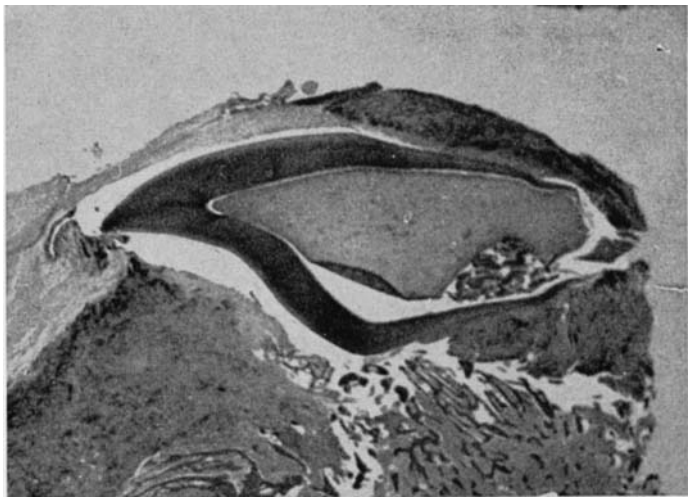

Fig. 5. Tooth germ partly destroyed by tumor tissue. (× 10).

## DISCUSSION

The tumor differed from the usual pattern in one respect. Because of unfortunate circumstances the proper time for surgical therapy was passed, and the tumor continued growing *usque ad mortem*. It seems to be the largest jaw tumor of this kind on record.

As a rule, these tumors are located in the maxilla. Only five mandibular tumors have been recorded. These tumors are normally unilateral, except one case of a bilateral maxillary growth has been reported by *Held* (1965).

The age of the infant when the lesion is observed usually is between one and three months, — in no case more than one year. — The case reported by *Lurie* (1961), — a melanotic progonoma in a 23 year-old Bantu woman, — apparently was a pigmented ameloblastic odontoma, probably related to the case of *Hodson* (1961), and should be excluded from the group of lesions here under discussion (*Kerr & Pullon*, 1964). — Pigmented ameloblastomas apparently are not infrequent. (*Williams*, 1967).

The tumor grows rapidly, but is more or less encapsulated, and does not metastasize. In most cases local surgery is successful, but recurrences are reported.

The histological descriptions given by various authors give the impression of considerable morphological variation. The actual observations are, however, similar and the seemingly wide range of variations is in part due to different interpretations, and consequently the use of various terminologies.

All authors have observed pigmented cells, varying in size and shape, and often lining round or cleft-like lumina. Some authors have stressed the epithelial-like appearence of these cells. Another fairly constant tumor component is groups of small round or ovoid cells with scanty cytoplasm and deeply stained nuclei. These cells resemble lymphocytes, and are by some authors considered to be of neural origin and called neuroblasts. Spindle-shaped cells are also described.

The histogenetic nature of the tumor has been a matter of controversy. The first case report of this tumor was given by *Krompecher* (1918) under the name melanocarcinoma congenitum. Other authors have considered the tumor to be of odontogenic origin because of the location of the lesion in the jaws, and the epithelial-like cells that might have some connection with tooth germs. Thus, the tumor was regarded as some sort of ameloblastoma and named melano-ameloblastoma or melanotic adamantinoma. Another theory has been launched by *Halpert* and *Patzer* (1947), who were impressed by the morphological similarity with some of the cellular elements of the retina. These authors assumed that the growth originated from retinal tissue elements misplaced during development, and proposed the name »retinal anlage tumor».

This theory is in a convincing way rejected by *Stowens* (1957) who suggested a new name, »melanotic progonoma». The author took into consideration comparative anatomical features, in particular the womero-nasal organ of Jacobson. The occurrence of the tumor in the maxilla and also in other locations was explained by assuming an organizer of sensory neuroectoderm acting over a wider anatomical area than is indicated by the final arrangement. By the term »progonoma» the author wanted to suggest »a tumour due to misplacement of tissue as the result of faetal atavism to a stage which does not occur in the life history of the species but which does occur in the ancestral forms of the species». Stowens found some histological similarities between this tumor and »the rare meanotic sarcomas of the maxilla».

Extensive reviews of the various names and theories of histogenesis are given by several authors, e.g. by *Lurie* (1961), *Dahlbäck* and *Thilander* (1964), *Kerr* and *Pullon* (1964), and will not be repeated here.

Tumors with the same histological and cytological composition as the pigmented jaw tumor, comprising patients of the same age group, have been found in other locations, e.g. in the epididymis (*Eaton & Fergusson*, 1956, *Frank & Kotten*, 1967), in the shoulder (*Blanc et al.*, 1958), in the scalp (*Clarke & Parsons*, 1951, *Kuhn et al.*, 1954), and in the mediastimum (*Misugi et al.*, 1965).

In particular the last case has been thoroughly examined. The histological picture was the same as that of the »melanotic progonoma». By electron microscopic investigation two types of pigmented cells were identified, — one large spindle-shaped cell with an abundant cytoplasm, and another smaller cuboidal cell with a small amount of cytoplasm filled with numerous pigment granules. These small pigmented cells formed gland-like structures with well formed continuous basement membranes. Transitional forms between the two types of cells were observed. The ultrastructure of these cells was consistent with that of melanocytes and melanoma cells.

The authors also described small undifferentiated cells with round or ovoid nuclei. Some of these cells had elongated cytoplasmic processes containing neurofilamentlike structures reminding of neuroblasts.

In conclusion the authors favored a neural crest origin of the cells of this tumor.

Summing up the main point of the preceeding text, some conclusions may be drawn:

Tumors of the same morphological appearance as the pigmented jaw tumor and comprising the same age group occur in several other locations. In a number of pigmented tumors the pigmented cells do not participate as tumor cells and do not influence the natural course of the neoplastic process. In the case of the pigmented jaw tumor, however, the pigmentproducing cells are the true tumor cells. There is no evidence of other neoplastic tissue present in this tumor.

As the melanocyte is the only cell capable of producing melanin, the pigmented jaw tumor is a melanocytic tumor. The wide range of morphological variation in the jaw tumor is consistent with the melanocytic tumor, which may present severe diagnostic difficulties by imitating other neoplasms of epithelial as well as of mesodermal origin. Under certain conditions — e.g. in childhood — the benign melanocytic tumor may assume the features of a malignant growth, as in the case of the juvenile melanoma. The pigmented jaw tumor, also, has much in common with a malignant melanoma, but metastases have never been reported.

There is no evidence supporting the concept of this tumor being of odontogenic nature. All names suggesting such origin should be abandoned. The same is true of the name retinal anlage tumor. (*Husted & Pindborg*, 1965).

The theory of a connection between this tumor and the organ of Jacobson must also be given up, as the tumor occurs not only in the maxilla, but in the mandibula and a number ot other locations.

The name »melanotic progonoma» is misleading, as it is apt to disguise the true melanocytic nature of the tumor. Taking into account the age group in

which the tumor occurs, as well as its origin and histological appearance, a proper name would be »pigmented melanocytoma of infancy». This term would include the jaw tumors as well as those occurring in other locations.

SUMMARY

The paper deals with a pigmented jaw tumor in an infant, who died by his tumor at the age of four months. Post-mortem examination showed no metastases.

The nature of this tumor is discussed. In the author's opinion this tumor is a *melanocytoma*, closely related to the juvenile melanoma.

RÉSUMÉ

TUMEUR PIGMENTAIRE DE LA MACHOIRE CHEZ UN NOURRISSON
CANCER MÉLANIQUE

Cet article rend compte d'un cas de tumeur pigmentaire de la mâchoire chez un nourrisson dont la mort survint comme suite de cette tumeur à l'âge de quatre mois. Aucune métastase n'été trouvée à l'autopsie.

La nature de cette tumeur fait l'objet d'une discussion. Pour l'auteur, il s'agit d'un cancer mélanique étroitement apparenté au mélanome juvénile.

ZUSAMMENFASSUNG

Es wird über einen Fall von einem pigmentierten Kiefertumor in einem neugeborenen Kind berichtet. Das Kind starb an diesem Tumor im alter von 4 Monaten. Die Autopsie gewährleistete keine Metastasen.

Die Natur des Tumors wird diskutiert. Der Verfasser hält den Tumor für ein *Melanocytom*, mit dem juvenilen Melanom vergleichbar.

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