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# Pilomatrixoma Pathology Description of Squamous Cell Carcinoma: A Case Report

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### ABSTRACT

**Background:** Pilomatrixoma is a benign neoplasm derived from hair follicles, and it rarely happens. Some cases were misdiagnostic with another skin lesion. One of them was squamous cell carcinoma (SCC). This study aimed to describe the pilomatrixoma pathology description of squamous cell carcinoma. **Case presentation:** A man, 72 years old admitted to the hospital with a chief complaint lump on his chin that penetrated into his mouth near the mandible gum. A lump had an irregular surface, hyperemic ulcer, bled easily, and penetrated into the mouth near the mandible gum. The size was 5x8x5cm, tenderness (+), and fixed with the mandible. There was no enlargement of neck nodes. The pathology description from the incision biopsy was pilomatrixoma. Wide excision, segmental mandibulectomy, and frozen section were performed on the patient, and the result was keratinizing SCC well differentiated. **Conclusion:** A man 72 years old with a lump on his chin was diagnosed with pilomatrixoma, a benign neoplasm that occurs in hair follicles and is a rare case.

## 1. Introduction

Pilomatrixoma is a benign skin neoplasm originating from hair follicle matrix cells and accounts for only 0.12% of skin tumor cases. Pilomatrixoma was first reported by Malherbe et al. in 1880. The picture they obtained was calcifying epithelioma, so in 1905, it was called Malherbe's calcifying epithelioma.<sup>1</sup> These lesions are most commonly found in the head and neck area. Another location is the upper extremity, and has rarely been reported elsewhere. Case series that have been reported by the literature are 364 cases of pilomatrixoma, with 15.3% located in the upper extremities.

Pilomatrixoma is most common in children, young adults, and especially in women. Other literature says 60% occur in the second decade and 84% in their 30s, although it has also been reported in all age groups. The malignancy that occurs in this lesion is pilomatrix carcinoma which is rare and, when it occurs, has a local aggressive nature and can occur repeatedly. Several cases have been reported of metastases. There are many similarities in the histopathological characteristics of pilomatrix in both malignant and benign cases, including a high mitotic rate with atypical mitoses, central necrosis, infiltration of the skin and soft tissues, and invasion of blood and lymph vessels.

Pilomatrix carcinoma is rare and is a type of malignancy with a low potential despite a high recurrence rate. Discussion of this lesion in some literature is still lacking, with few cases reports showing a spectrum of changes toward malignancy in this lesion. A case of pilomatrixoma was reported in an adult patient with an atypical appearance. The tumors obtained were small in size and showed a picture of progression toward malignancy but did not meet the criteria of pilomatrix carcinoma. These focal features include an infiltrative focal pattern on the periphery, with variable atypia cytology and an increased mitotic rate of more than 5 per large field of view. Some lobules show comedo necrosis or irregular central foci of necrosis. The report referred to as "proliferating pilomatrixoma".<sup>2,3</sup> These lesions are solitary, rubbery to hard in consistency, and often show a "tent sign" on the skin surface. Multiple tumor occurrences are rare, and when they do occur are usually associated with syndrome-associated lesions. The size of the tumor can reach 3cm in diameter with a sandy surface and a pale color which is the result of tumor calcification. Clear tumor boundaries, from the dermis to the subcutaneous layer, are composed of several components, including basaloid proliferation, shadow cells or ghost cells, dystrophic calcifications, and foreign body-giant cell reactions. The basaloid cells are closely adherent, usually more prominent at the tumor margins, and are multilayered with a monotonous cell. The cells are arranged sequentially with indistinct or blurred cell edges with a high nuclear-to-cytoplasmic ratio. They have a high mitotic index with keratinized ghost cells. Ghost cells have eosinophilic cytoplasm and a negative space where the nucleus is present. Dystrophic calcification begins in ghost cells in the form of fine granules.<sup>3</sup>

The tumor is often cystic and may rupture. Ghost cells can be destroyed by the giant cell reaction. In rare cases, melanin and extramedullary hematopoiesis may be seen. The presence of a population of basaloid cells frequently seen in FNA material can be interpreted as carcinoma.<sup>4</sup> The differential diagnosis of pilomatrixoma includes epidermal cyst, dermoid cyst,

squamous cell carcinoma, basal cell carcinoma, some follicular neoplasms such as trichoblastoma, and giant cell lesions.<sup>4</sup> Histological confirmation of pilomatrixoma after excision of the lesion is actually relatively easy, but preoperative diagnosis is more difficult in cytopathological samples with false positive results of malignancy. The most common preoperative diagnosis of malignancy is squamous cell carcinoma, while basal cell carcinoma, cutaneous carcinoma, and neuroendocrine metastases, and melanoma are rare. It was reported by an otolaryngologist that pilomatrixoma was diagnosed as a subcutaneous mass on the head and neck with squamous cell carcinoma. Misinterpretation of cytopathology must be alerted to avoid overly aggressive surgical intervention in benign neoplasms.<sup>5</sup> One of the previously reported cases of misdiagnosis was a 58-year-old woman with a mass in the posterior colli with a history of postoperative excision of basal cell carcinoma of the upper extremity. On physical examination, there was a mass with a size of 0.5 cm in the posterior colli with firm boundaries and mobile dams as subcutaneous nodules. There were no other colli masses and aerodigestive lesions. FNAB examination was carried out, and SCC metastases were obtained. PET / CT scan results showed a subcutaneous mass in the posterior neck measuring 0.5 cm and Fluorodeoxyglucose avid with a standard uptake of 2.6, which is a metastasis in the occipital nodes. MRI of the head and neck and CT scan of the thorax, abdomen, and pelvis failed to identify a primary tumor or distant metastases. Then the FNAB erase preparation was re-evaluated and found dispersed squamous cells with dense cytoplasm and prominent nucleoli, ghost cells with a background of scattered neutrophils, lymphocytes, and multi-nucleus giant cells. And from these results, the patient was diagnosed with pilomatrixoma. Then excision and tumor-free margins were performed, the patient was evaluated during the first 2 postoperative years, and no recurrence was found.<sup>5</sup> When stratified by age group, clinically, the differential diagnoses of pilomatrixoma in children are epidermal cyst,

ossifying hematoma, branchial remnant, preauricular sinus, lymphadenopathy, giant cell tumor, chondroma, dermoid cyst, degenerating fibroxanthoma, foreign body reaction, and osteoma cutis. If it is located in the preauricular area, it can also be similar to a lesion in the parotid gland. In adults and elderly patients, clinically, the differential diagnoses include metastatic lymphadenopathy and primary skin neoplasms. Whereas pilomatrix carcinoma is more common in older men and has a tendency to local invasion and recurrence. Imaging examination of pilomatrixoma is rarely done, but if there is a subcutaneous lesion with well-defined boundaries with various calcifications. Imaging studies can mimic pathological lymphadenopathy and are sometimes useful in differentiating pilomatrixoma in the preauricular region from a superficial parotid neoplasm. The histological diagnosis of pilomatrixoma is not too difficult, with the characteristic finding of clusters of ghost cells "ghost cells" or "shadow cells" surrounded by basaloid cells (Figure 2). Ghost cells are a pathognomonic appearance consisting of anuclear squamous cells with an unstained central area. The surrounding basal cells show a strongly basophilic stained nucleus with scant cytoplasm and indistinct margins. Areas of ghost cells may show peripheral calcification and granulomatous reactions, including foreign body giant cells.<sup>5</sup> This study aimed to describe pilomatrixoma pathology description on squamous cell carcinoma.

## 2. Case Presentation

A 72-year-old man complained of a lump on his chin that extended to his lower lip. Since 6 months ago, the patient has complained of a lump on his chin which he feels is getting bigger and bigger. At first, the lump was the size of a pea, and then it grew to the size of a fist and extended to the lower lip and the inside of the lower lip. Complaints accompanied by pain and bleeding easily. Another lump in the neck was denied. Complaints are not accompanied by hoarseness or shortness of breath. Then the patient went to Sukabumi Hospital and was referred to RSHS. Based

on the results of the physical examination, vital signs were within normal limits, with the patient's weight 55 kg and height 160 cm. For the generalist status of the patient, there is also no abnormality. From the local status of the mental region, on inspection, a lumpy mass with a reddish color was found, with ulcers in several places and bleeding easily. The mass extended superiorly to the lower margin of the labium oris inferior and penetrated the mucosa of the gingiva of the right to left canines. On palpation, we found a mass that bleeds easily, measuring 5x8x5cm, tender (+), fixed to the mandible. No lymph node colli enlargement was found. From a CT scan of the head and neck with contrast, a solid lobulated mass was found in the mental subcutis area, which extends to the submental and mandibular bilaterally, which obliterates m. mentalist, m. depressor labii inferioris bilateral, and m. orbicularis oris inferior, infiltrating the labia inferior and m. bilateral anguli oris depressor, destroying mandibular symphysis to dental alveolar. Mental soft tissue mass, no lymph node enlargement, no intracranial metastases. Histopathological results showed pilomatrixoma. The patient then underwent wide excision surgery and segmental mandibulectomy. During the operation, a frozen section examination was carried out, and a keratinizing squamous cell carcinoma was found, well-differentiated R. submental with the basis of the operation and the boundaries of the surgical incision in several places that were not tumor free. Postoperatively the patient underwent external radiation.

Macroscopic: Received pieces of tissue weighing 0.5 grams of chewy brownish white. Microscopy: The biopsy preparation labii inferior et mentale appears to be lined with keratinized squamous epithelium, and the nucleus is within normal limits. The subepithelium consists of fibrocollagenous connective tissue stroma covered with inflammatory cells, lymphocytes, plasma cells, and histiocytes. It can be seen that there are clusters of hair follicle matrix cells, and the nucleus is within normal limits. Ghost cells are also visible.



Figure 1. Clinical picture of the patient from the front, right and left side. In the mental region, on inspection, found a lumpy mass with a reddish color, with ulcers in several places and bleeding easily. The mass extended superiorly to the lower margin of the labium oris inferior and penetrated the mucosa of the gingiva of the right to left canines. On palpation, a mass that bleeds easily, measuring 5x8x5cm, tender (+), fixed to the mandible was found.



Figure 2. Intraoral clinically found a mass extending to the gingival mucosa.





Figure 3. Head and neck CT scan. Lobulated solid mass in the area of the mental subcutis, which extends to the submental and mandibular bilaterally, which obliterates m. mentalis, m. depressor labii inferioris bilaterally, and m. orbicularis oris inferior, infiltrating the labia inferior and m. bilateral anguli oris depressor, destroying mandibular symphysis to dental alveolar. Mental soft tissue mass, no lymph node enlargement, no intracranial metastases.



Figure 4. Operation preparation. The patient is positioned supine under general anesthesia and planned wide excision with segmental mandibulectomy.



Figure 5. Intraoperative findings revealed a mass measuring 7x9x7cm with part of the segmental mandibulectomy measuring 5x5x3cm.

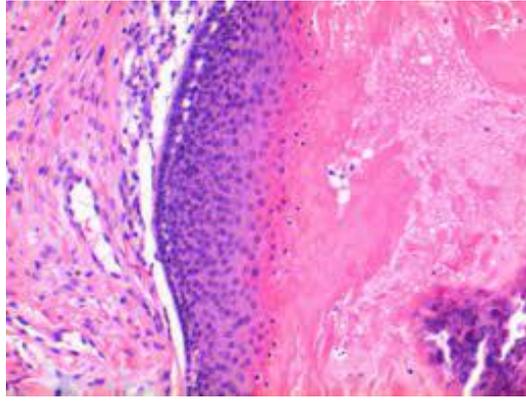


Figure 6. Pre-operation histopathology description.

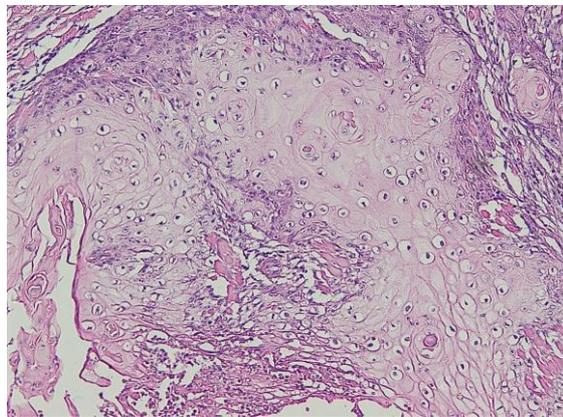


Figure 7. During operation, pathology frozen section description.

**Macroscopic:** Received a skinned tissue, marked thread 1,2,3,4 and 2 short threads (base) size 9x8x2.5cm reddish white springy, partly fragile. On the surface of the skin, a 7x6x1cm fragile nodule appears. The basis of the operation is fascia. Reddish white solid lamellae Partially brittle.

**Microscopy:** Tumor mass consisting of cells of polygonal shape, which grow hyperplastic, condensed, and clustered. Nucleus pleomorphic, hyperchromatic, partially vesicular, clear nuclei, mitoses present. The connective tissue stroma includes lymphocyte inflammatory cells with dilation of blood vessels. A keratin mass is seen (red star). (200x)

### 3. Discussion

Pilomatricoma is a benign neoplasm originating in the hair follicle and is rare. From the literature, it has been reported that only 0.12% of cases of skin tumors.

These lesions are most commonly found in the head and neck area. Another location is the upper extremity, and has rarely been reported elsewhere. Pilomatricoma is most common in children, young adults, and especially in women. Other literature says 60% occur in the second decade and 84% in their 30s, although it has also been reported in all age groups.<sup>2</sup> The differential diagnosis of pilomatricoma includes epidermal cyst, dermoid cyst, squamous cell carcinoma, basal cell carcinoma, some follicular neoplasms such as trichoblastoma, and giant cell lesions.<sup>4</sup> The differential diagnosis of pilomatricoma can be grouped based on the patient's age. Clinically the differential diagnoses of pilomatricoma in children are epidermal cyst, ossifying hematoma, branchial remnant, preauricular sinus, lymphadenopathy, giant cell tumor, chondroma, dermoid cyst, degenerating fibroxanthoma, foreign body reaction, and osteoma

cutis. If it is located in the preauricular area, it can also be similar to a lesion in the parotid gland. In adults and elderly patients, clinically, the differential diagnoses include metastatic lymphadenopathy and primary skin neoplasms. Whereas pilomatrix carcinoma is more common in older men and has a tendency to local invasion and recurrence.<sup>5</sup> The pathological diagnosis of pilomatrixoma anatomy in several case reports is often erroneous, especially when preoperative samples are taken with FNA. Brandon et al. once reported the case of a 58-year-old woman with a preoperative diagnosis taken from a cytopathological sample was metastatic squamous cell carcinoma. After an excisional biopsy was performed, the PA result was pilomatrixoma. Misclassification of pilomatrixoma on FNA examination is common and frequently diagnosed as SCC, epidermal inclusion cyst, and giant cell lesion. Previous reports have stated that the potential for error indicating the right preoperative diagnosis based on cytopathological examination is only 38%, with 25% of cases suspected of being malignant and previously resected. Features characterized by a high component of the specimen, the presence of primitive cells with a high nuclear-to-cytoplasmic ratio, prominent nucleoli, nuclear molding, and mitotic features are usually associated with a malignant process. In the background, there is abundant debris and inflammatory cells, which are often confused with the necroinflammatory debris that is characteristic of malignancy. Misinterpretation of FNA specimens can be caused by the underrepresentation of the sample, the predominance of a single cellular component in the sample, and the limited accuracy of the cytological picture showing pilomatrixoma by a pathologist. Several studies have shown that ghost cells are seen more frequently in cell block sections than in smear-shaped FNA samples. Other studies mention that there are difficulties in identifying ghost cells in smears fixed with alcohol when compared to dry smears (air-dried smears).<sup>5</sup>

In the case presented, namely a 72-year-old man, in general, the histopathological results from a preoperative incision biopsy were pilomatrixoma,

whereas, during the operation, a well-differentiated squamous cell carcinoma with non-tumor-free incision edges was found. There were differences in the histopathological results obtained. The reason for the difference in the pathological results of the pilomatrixoma case with others, especially squamous cell carcinoma, has also been reported by several authors, among others. The most frequent is the difference in the cytological results of FNA preparations with the histopathological results of postoperative excision preparations. While in the case described above, there are histopathological differences between incisional and wide excision biopsies. To find out what causes the difference in results, we need to know the histopathology of squamous cell carcinoma and pilomatrixoma. When compared with the histopathological picture of squamous cell carcinoma, pilomatrixoma has similarities, among others, both originate from epithelial cells, can be surrounded by basaloid cells, have foreign body-giant cell reactions, have a high mitotic index, and there is a process of keratinization. In the background, there is abundant debris and inflammatory cells, which are often confused with the necroinflammatory debris that is characteristic of malignancy.<sup>5</sup> The histopathological picture of pilomatrixoma is a collection of ghost cells, "ghost cells" or "shadow cells," surrounded by basaloid cells. Ghost cells are the pathognomonic feature consisting of anuclear squamous cells with an unstained central area. The surrounding basal cells show a strongly basophilic stained nucleus with scant cytoplasm and indistinct margins. Areas of ghost cells may show peripheral calcification and granulomatous reactions, including foreign body giant cells.<sup>5</sup> Ghost cells are large balloon-shaped, may be oval or elongated, elliptical epithelial cells, and are eosinophilic, sometimes showing cell-to-cell fusion. Ghost cells show calcification and lose cellular outline and form sheet-like areas. The appearance of ghost cells is actually not only found in pilomatrixoma and can also be found in odontogenic and nonodontogenic neoplasms, such as calcifying cystic odontogenic

tumor (CCOT), dentinogenic ghost cell tumors, odontogenic ghost carcinoma, odontoma, ameloblastoma, adenomatoid odontogenic tumor, ameloblastic fibroma, and pilomatrixoma.<sup>6</sup> Ghost cells were first discovered by Highman and Ogden in 1944 in cases of pilomatrixoma. It is said that ghost cells are dyskeratotic cells. While Hashimoto found that in pilomatrixoma, there is a gradual increase in keratinization from basaloid cells to ghost cells. Ghost cells originate from epithelial cells and from any layer and lack intercellular junctions. Gorlin stated that ghost cells exhibit normal and abnormal keratinization and represent squamous metaplasia with calcification caused by an ischemic process. Sedano and Pindborg also suggested that ghost cells represent stages of normal or aberrant keratin formation and that they originate from odontogenic epithelial metaplasia.<sup>6</sup> Metin et al. once conducted a case report of a 25-year-old man who came with the main complaint of a lump on his left cheek a size of 7x8x5cm in front of his left ear, a lump with an uneven surface, lumpy and visible ulceration. The lump looks exophytic. Even though it is hard to touch, it is not fixed to the underlying tissue and has the impression of a mass originating from the left parotid. The patient had a punch biopsy performed with the results of epithelial cell malignancy. Then an excisional biopsy was performed, and the results of pilomatrixoma were obtained. In this case, the discussion about the differences in the results of the punch biopsy and excisional biopsy is that clinically the mass is anterior to the left auricle and gives the impression of a parotid mass even though it is large and ulcerated and hard, the mass is not fixed in the underlying tissue. In the literature, several cases of giant pilomatrixoma (diameter > 5cm) with a size of 30cm have been reported. The punch biopsy material could have been from a zone where atypical mitosis predominated and only basal cells were found, and this led to a misdiagnosis. The definitive diagnosis is obtained after complete resection of the tumor. Parotid tumor types such as pleomorphic adenoma, Whartin's tumor, monomorphic adenoma, oncocytoma, mucoepidermoid carcinoma, malignant mixed tumor,

and actinic cell carcinoma are the differential diagnoses in this case.<sup>7-13</sup> The reason for the difference in the histopathological results in the cases described could be due to the samples taken in incisional biopsies and showing a ghost cell picture which is a zone of squamous cells undergoing metaplasia and because the number of incisional biopsy samples is less when compared to samples taken in wide excision, where in samples taken after wide excision, it can be seen that the process of keratinization is clearer which indicates a well-differentiated squamous cell carcinoma. What also needs to be considered is that, in the case described, there was clinically a mass that extended inward to the mandibular gingiva area. When viewed from the histopathology of pilomatrixoma, it originates from superficial hair follicles, although if it becomes a carcinoma, it can grow aggressively, can invade deeper tissues, and has a high recurrence rate. So the differential diagnosis in this patient is malignancy.<sup>14-17</sup>

#### **4. Conclusion**

A man 72 years old with a lump on his chin was diagnosed with pilomatrixoma, a benign neoplasm that occurs in hair follicles and is a rare case.

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