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Demographic and clinicopathological features and long-term results of pediatric cases diagnosed with pilomatrixoma

Pilomatriksoma tanılı pediatrik olguların demografik ve klinikopatolojik özellikleri ile uzun dönem sonuçları

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Abstract

Objectives: In this study, we present our experience with pilomatrixoma in pediatric patients.

Patients and methods: Between January 2013 and January 2023, a total of 86 children (29 males, 57 females; mean age: 10.8±4.2 years; range, 1 to 18 years) who were diagnosed with pilomatrixoma based on histopathological examination of excisional biopsies were included. Demographic characteristics of the patients, symptoms, location of lesions, radiological imaging results and pathology reports were obtained from the medical records.

Results: The number of patients under the age of 10 diagnosed with pilomatrixoma was 29 (33.7%), while there were 57 (66.2%) patients between 10 and 18 years of age. Eighty-three (88.3%) of our cases were in the form of a single nodule, and three (11.6%) were in the form of multiple nodules. In terms of tumor localization, 38 (42.6%) were located in the head and neck region, 29 (32.5%) in the upper extremities, 14 (15.7%) in the trunk and eight (8.9%) in the lower extremities. One patient (1.1%) was reoperated due to recurrence during postoperative follow-up.

Conclusion: Pilomatrixoma should be surgically excised, as it can be confused with other subcutaneous tumors usually seen in children and adolescents. Its ability to show malignant transformation over time should not be overlooked.

Keywords: Childhood tumors, pilomatrixoma, surgical excision.

Öz

Amaç: Bu çalışmada pediatrik hastalarda pilomatriksomaya ilişkin deneyimlerimiz sunuldu.

Hastalar ve Yöntemler: Ocak 2013 - Ocak 2023 tarihleri arasında eksizyonel biyopsinin histopatolojik incelemesi sonucunda pilomatriksoma tanısı konan toplam 86 çocuk (29 erkek, 57 kadın; ort. yaş: 10.8±4.2 yıl; dağılım, 1-18 yıl) çalışmaya dahil edildi. Tıbbi kayıtlardan hastaların demografik özellikleri, semptomları, lezyon yerleri, radyolojik görüntüleme sonuçları ve patoloji raporları kaydedildi.

Bulgular: On yaş altı pilomatriksoma tanılı hasta sayısı 29 (%33.7) iken, 10 ila 18 yaş arası 57 (%66.2) hasta vardı. Olgularımızın 83'ü (%88.3) tek nodül ve üçü (%11.6) çoklu nodül şeklindeydi. Tümör yerleşimi açısından 38'i (%42.6) baş ve boyun bölgesinde, 29'u (%32.5) üst ekstremitelerde, 14'ü (%15.7) gövdede ve sekizi (%8.9) alt ekstremite yerleşimliydi. Bir hasta (%1.1) nüks nedeniyle ameliyat sonrası takip sırasında yeniden ameliyat edildi.

Sonuç: Pilomatriksoma, genellikle çocuk ve ergenlerde görülen diğer cilt altı tümörler ile karışabileceği için cerrahi olarak eksize edilmelidir. Zaman içinde malign transformasyon gösterebilme özelliği de göz ardı edilmemelidir.

Anahtar sözcükler: Çocukluk çağı tümörleri, pilomatriksoma, cerrahi eksizyon.

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Pilomatrixoma, Malherbe's calcified epithelioma, is a benign soft tissue tumor originating from pluripotent matrix cells of hair follicles.[1] This tumor was first described by Malherbe and Chenantais[2] in 1880 as a calcified tumor consisting of sebaceous glands. It was defined to originate from hair follicle matrix cells by Lever and Griesemer[3] in 1949. In 1961, Forbis and Helwig[4] named this tumor pilomatrixoma. The tumor appears as slow-growing, firm and mobile masses located under the skin. Although the true

incidence is unknown, there are studies reporting incidence between 0.03 and 0.1%.[5] It is mostly seen before the age of 20 and is more common in women with a ratio of 3:2 compared to men.[6] It is mostly observed in the head and neck region (50%), less frequently in the trunk, arms and legs.[5] Treatment is simple excision. Definitive diagnosis is made after histopathological evaluation. Rare and malignant forms of the tumor have been described in the literature. These malignant forms, called pilomatrix carcinoma, metastasize to lung, bone, brain, skin, lymph node and abdominal organs.[7]

In the present study, we aimed to share our experience with pilomatrixoma, a rare skin tumor that can transform into a malignant type over time and is frequently seen in the childhood age group.

PATIENTS AND METHODS

This single-center, retrospective study was conducted at University of Health Sciences, Eskişehir City Hospital, Department of Pediatric Surgery between January 2013 and January 2023. A total of 86 children (29 males, 57 females; mean age: 10.8±4.2 years; range, 1 to 18 years) who were diagnosed with pilomatrixoma based on histopathological examination of excisional biopsies were included. Demographic characteristics, symptoms, location of lesions, radiological imaging results and pathology reports were obtained from the medical records. In addition, it was noted whether the patients had recurrence during follow-up. Positive pathological report was based on the presence of ghost cells (ghost or shadow) in the tissue examined, pathognomonic for pilomatrixoma, and calcium deposition in parenchymal tumor cells and/or connective tissues.

Statistical analysis

Statistical analysis was performed using the IBM SPSS for Windows version 26.0 software (IBM Corp., Armonk, NY, USA). Continuous variables were expressed in mean ± standard deviation (SD), while categorical variables were expressed in number and frequency.

RESULTS

The patients presented with the complaints of subcutaneous, firm, mobilizable and well-circumscribed nodules. While the number of the patients under the age of 10 diagnosed with pilomatrixoma was 29 (33.7%), there were 57 (66.2%) patients between 10 and 18 years of age. No other concomitant disease was detected in the patients. Routine hematological examinations and superficial tissue ultrasonography (USG) were performed in all patients after admission. Regularly-contoured isoechoic lesions containing hyperechoic structures and thickening of the surrounding skin and subcutaneous tissues were found in most of the patients who underwent superficial tissue USG. Advanced radiological imaging methods were not needed due to the localization of the lesions. Eighty-three (96.5%) of our cases were in the form of a single nodule and three (3.5%) were in the form of multiple nodules (two in the neck and back region, one in the anterior thoracic wall and lower extremity). In terms of tumor localization, 38 (42.6%) were located in the head and neck region, 29 (32.5%) in the upper extremities, 14 (15.7%) in the trunk, and eight (8.9%) in the lower extremities (Table 1).

Following the necessary preoperative preparations, surgical total excision was performed for all of the lesions. In terms of tumor diameter, 63 (73.2%) were between 1 and 3 cm, while the rest were less than 1 cm in size. On histopathological examination, ghost cells (ghost or shadow) and foreign body inflammatory granulation tissue around the tumor, which are pathognomonic for pilomatrixoma, were observed in all cases (Figure 1).

In early lesions, ghost cells mixed with keratin (eosinophilic cells without nuclei resulting from the keratinization of basaloid cells) and small cystic tumor islands lined with basaloid cells were seen. Cells in the islands had a circular configuration, cells with basophilic nuclei were located at the periphery and shadow cells without nuclei were located in the center. In late lesions, peripheral basaloid cells were not usually seen, but calcification and sometimes

TABLE 1
Locations and rates of cases

No	Localization	Number of lesions	Ratio (%)
1	Head and neck	38	42.7
2	Upper extremity	29	32.6
3	Trunk	14	15.7
4	Low extremity	8	9.0
Total		89	100

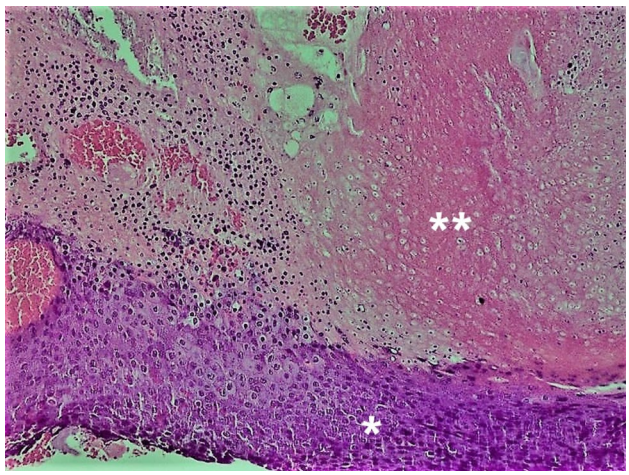

Figure 1. Basaloid cell layer with trichilemmal keratinization and a ghost cell island (H&E, ×200).

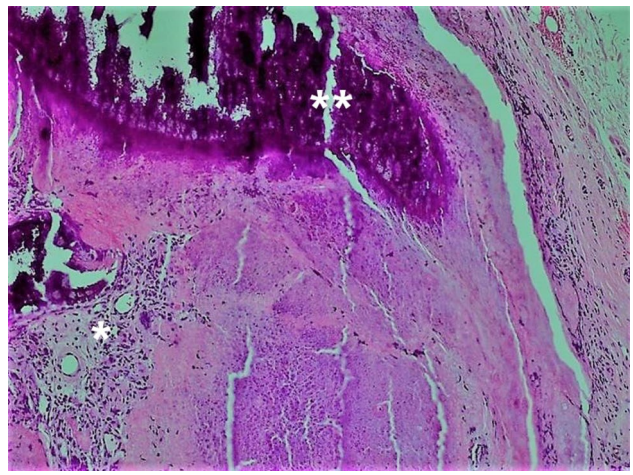

Figure 2. Areas of cellular reaction containing foreign body giant cells and dystrophic calcification (H&E, ×200).

ossification were frequently detected due to necrosis (Figure 2).

No malignant transformation was detected in any of the lesions with histopathological examination. In the postoperative period, all of the patients were called for check-ups every three months, for an average of one year. During postoperative follow-up, recurrence was detected in one patient (1.1%) three months after the operation and re-excision was performed.

DISCUSSION

Pilomatrixoma is a slow growing, subcutaneous benign tumor that is usually mobilizable. Lesions may be soft and cystic in the early stages, but are characteristically firm and well circumscribed in the later stages. In cases where the lesion is very superficial, it may have dark red shade, vivid blue or black discoloration, similar to overlying skin telangiectasia or hemangioma.[8] Our patients mainly complained of mostly painless hard swellings. Pilomatrixoma has biphasic age distribution. It was reported that 40% of these tumors are seen under the age of 10, and more than 60% are seen in the first two decades of life.[9] About 40% of lesions are seen in the sixth and seventh decades. In our study, 66.2% of the cases were between the ages of 10 and 18. Pilomatrixoma is most common in the head and neck region (40 to 77%), while the remainder are seen in the upper extremities, trunk and lower extremities at decreasing rates.[10] It is usually detected as a single lesion, and multiple lesions have been reported with rates of 2 and 10%.[5] Gardner syndrome, myotonic dystrophy, Steinert's disease, and pilomatrixoma with sarcoidosis were identified, although no significant correlation was established between these diseases and pilomatrixoma.[9] In our study, while the lesions were mostly found in the head and neck region, multiple nodules were detected in only three cases. There was no other accompanying disease in the history and clinical evaluations of our patients. Although trauma and infection may play a role in the etiology, it is not known exactly. Pilomatrixomas may develop as a result of a pause in the cycle of hair follicles.[11] Beta-catenin mutation mapped in the 3p22-p21.3 gene locus was found in 75% of pilomatrixomas, but its exact role is still unknown.[12] In our patients, no etiological factor was determined. Although differential diagnosis varies according to the localization of the tumor, sebaceous cyst, ossifying hematoma, branchial debris, preauricular sinus, lymphadenopathy, chondroma, giant cell tumor, dermoid cyst, degenerated fibroxanthoma, lipoma, and foreign body reactions should be considered.[13] Although USG, CT and MRI can be preferred for radiological differential diagnosis, pilomatrixoma does not have a clear pathognomonic feature. Calcified foci on plain X-ray films and a well-defined, round hyperechoic mass with a posterior dense acoustic shadow can be detected with USG. Large tumors or unusual locations may require cross-sectional imaging with computed tomography (CT) or magnetic resonance

imaging (MRI) for appropriate surgical intervention planning. Internal reticulation and patch-shaped areas are seen in the mass, which is observed as a calcified area under the skin on CT, and high-signal bands can be observed in the T2 sequence on MRI.[12] Superficial tissue USG performed in the preoperative period revealed subcutaneous, well-circumscribed, hyperechoic masses in our cases. No further radiological examinations were required.

Fine needle aspiration biopsy (FNAB) may be helpful in diagnosing pilomatrixoma cases. The presence of ghost cells, calcium deposits, nucleated squamous cells and basaloid cells in the aspiration material is diagnostic.[13] However, even experienced cytologists can incorrectly diagnose carcinoma. Therefore, total excision of the tumor and histopathological examination are essential for definitive diagnosis. Pilomatrixoma is a well-circumscribed tumor located in the dermis and subcutaneous tissue, surrounded by connective tissue, and is separated from the epidermis by a band of fibrous tissue. This fibrous layer creates the illusion of sticking to the skin, but there is actually no connection between the tumor and the epidermis. Tumor sizes usually vary between 0.5 and 3 cm, but tumors over 15 cm were also reported.[14] Tumor sizes in our patients ranged from 0.4 cm to 2.5 cm. On histopathological examination, pilomatrixomas consist of well-organized cell islands. In these islands, basaloid cells with preserved nuclei in the periphery and ghost or shadow cells in the center are arranged in a circular manner. The transitional cells between these two cell groups are apoptotic cells that would turn into ghost cells. Ghost cells form as a result of keratinization of the basaloid cells and the number of ghost cells increases with the age of the lesion, while basaloid cells may disappear completely.[15] Granulomatous inflammation, foreign body giant cells and calcification are common findings in pilomatrixomas.[16] In the histopathological examination of our cases, ghost cells mixed with keratin in the middle (eosinophilic cells without a nucleus formed as a result of keratinization of basaloid cells) and small cystic tumor islands lined with basaloid cells were seen in the early lesions. Peripheral basaloid cells were not usually seen in late lesions. In these lesions, the tumor usually consisted of ghost cells and keratin. The prognosis of pilomatrixomas is usually good and the recurrence rate after total excision is very low.[17] Recurrence was observed in one 16-year-old patient among our cases. There are very few studies about the malignant transformation of pilomatrixoma and its incidence is not known exactly. Malignant transformation was detected more frequently in males, and the mean age of incidence was calculated as 45.[18] Careful histological study is required to exclude malignant forms. In malignant forms, larger epithelial cell component, undifferentiated basaloid cells cluster, atypical cells, blood vessel and capsular tissue invasion are seen.[19] Cases with malignant transformation were named calcified epithelial carcinoma of Malherbe or pilomatrix carcinoma. If the tumor adheres to the overlying skin or has an ulcerative form, the skin tissue overlying the lesion should also be excised. The histopathological findings of our cases who underwent excisional biopsy were consistent with typical pilomatrixoma and did not contain malignant transformation.

The limitation of this study is that the data are retrospective. All procedures were performed in a single institution and the number of patients was limited, allowing descriptive rather than comparative analyses.

In conclusion, pilomatrixoma is usually a benign tumor and total excision can be curative. However, histopathological and clinical features should be carefully evaluated in these cases not to miss the malignant form that carries the risk of metastasis.

Ethics Committee Approval: The study protocol was approved by the University of Health Sciences, Eskişehir City Hospital, Clinical Research Ethics Committee (date: 20.06.2023, no: ESH/GOEK 2023/33). The study was conducted in accordance with the principles of the Declaration of Helsinki.

Patient Consent for Publication: A written informed consent was obtained from the patients and/or parents of the patients.

Data Sharing Statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

Author Contributions: Idea/concept, control/supervision, data collection and/or processing, references and fundings, materials: A.S.B., B.E.; Design, analysis and/or interpretation, literature review, writing the article, critical review: A.S.B.

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REFERENCES

1. Schwarz Y, Pitaro J, Waissbluth S, Daniel SJ. Review of pediatric head and neck pilomatrixoma. Int J Pediatr Otorhinolaryngol 2016;85:148-53. doi: 10.1016/j.ijporl.2016.03.026.
2. Kumaran N, Azmy A, Carachi R, Raine PA, Macfarlane JH, Howatson AG. Pilomatrixoma--accuracy of clinical diagnosis. J Pediatr Surg 2006;41:1755-8. doi: 10.1016/j.jpedsurg.2006.05.005.
3. Lim HW, Im SA, Lim GY, Park HJ, Lee H, Sung MS, et al. Pilomatricomas in children: Imaging characteristics with pathologic correlation. Pediatr Radiol 2007;37:549-55. doi: 10.1007/s00247-007-0461-x.
4. Forbis R Jr, Helwig EB. Pilomatrixoma (calcifying epithelioma). Arch Dermatol 1961;83:606-18. doi: 10.1001/archderm.1961.01580100070009. PMID: 13700704.
5. Lemos LB, Brauchle RW. Pilomatrixoma: A diagnostic pitfall in fine-needle aspiration biopsies. A review from a small county hospital. Ann Diagn Pathol 2004;8:130-6. doi: 10.1016/j.anndiagpath.2004.03.004.
6. Guinot-Moya R, Valmaseda-Castellon E, Berini-Aytes L, Gay-Escoda C. Pilomatrixoma. Review of 205 cases. Med Oral Patol Oral Cir Bucal 2011;16:e552-5. doi: 10.4317/medoral.16.e552.
7. Jones C, Twoon M, Ho W, Portelli M, Robertson BF, Anderson W. Pilomatrix carcinoma: 12-year experience and review of the literature. J Cutan Pathol 2018;45:33-8. doi: 10.1111/cup.13046.
8. Neema S, Kashif AW, Vasudevan B. Dermoscopy of pilomatrixoma. Indian Dermatol Online J 2022;14:450-1. doi: 10.4103/idoj.idoj_376_21.
9. Carcassola MV, de Campos WG, Lemos CA, Milani BA, Psciolaro RL, Ceccheti MM. Pilomatrixoma in the cheek: A clinical case report. Autops Case Rep 2022;12:e2021387. doi: 10.4322/acr.2021.387.
10. Hu JL, Yoo H, Kwon ST, Kim S, Chung JH, Kim H, et al. Clinical analysis and review of literature on pilomatrixoma in pediatric patients. Arch Craniofac Surg 2020;21:288-93. doi: 10.7181/acfs.2020.00528.
11. Alturkistany W, Alrajeh M, Alsheikh O. A rapidly growing pedunculated pilomatrixoma of the eyelid. Oman J Ophthalmol 2023;16:136-8. doi: 10.4103/ojo.ojo_79_22.
12. Kumar S. Rapidly growing pilomatrixoma on eyebrow. Indian J Ophthalmol 2008;56:83-4. doi: 10.4103/0301-4738.37585.
13. Zhao A, Kedarisetty S, Arriola AGP, Isaacson G. Pilomatrixoma and its imitators. Ear Nose Throat J 2021:1455613211044778. doi: 10.1177/01455613211044778.
14. Yamauchi M, Yotsuyanagi T, Saito T, Ikeda K, Urushidate S, Higuma Y. Three cases of giant pilomatrixoma--considerations for diagnosis and treatment of giant skin tumours with abundant inner calcification present on the upper body. J Plast Reconstr Aesthet Surg 2010;63:e519-24. doi: 10.1016/j.bjps.2009.12.006.
15. Veena KM, Chandra J. Pilomatrixoma: A common tumour of head and neck, but rarely reported. BMJ Case Rep 2021;14:e238033. doi: 10.1136/bcr-2020-238033.
16. Pirouzmanesh A, Reinisch JF, Gonzalez-Gomez I, Smith EM, Meara JG. Pilomatrixoma: A review of 346 cases. Plast Reconstr Surg 2003;112:1784-9. doi: 10.1097/01.PRS.0000091160.54278.64.
17. Tavares AT, Neiva-Sousa M, Semedo C, Martins M, Gomes P. Pilomatrixoma recurring as giant form. Cureus 2022;14:e21308. doi: 10.7759/cureus.21308.
18. Toffoli L, Bazzacco G, Conforti C, Guarneri C, Giuffrida R, Zelin E, et al. Pilomatrix carcinoma: Report of two cases of the head and review of the literature. Curr Oncol 2023;30:1426-38. doi: 10.3390/curroncol30020109.
19. Naveed H, Yaqoob N, Muhammad S, Aftab K, Raza MR. Pilomatrix carcinoma in a 4-year-old child with an unusual presentation. J Ayub Med Coll Abbottabad 2022;34(Suppl 1)(4):S1046-9. doi: 10.55519/JAMC-04-S4-10675.