REVISTA CHILENA DE PEDIATRÍA
www.revistachilenadepediatria.cl
www.scielo.cl

Rev Chil Pediatr. 2020;91(1):99-104
DOI: 10.32641/rchped.v91i1.1303

CLINICAL CASE

Pigmented Dermatofibrosarcoma Protuberans: description of a pediatric case

Dermatofibrosarcoma protuberans pigmentado: descripción de un caso pediátrico

Nieto-Benito, LM[a], Berenguer-Fröhner, Beatriz[b], Parra-Blanco, Verónica[c], Campos-Domínguez, Minia[a]

[a]Department of Dermatology and Venereology. Hospital General Universitario Gregorio Marañón, Madrid, Spain
[b]Department of Pediatric Plastic Surgery. Hospital General Universitario Gregorio Marañón, Madrid, Spain
[c]Department of Pathology, Hospital General Universitario Gregorio Marañón, Madrid, Spain

Received: 24-6-2019; Approved: 26-8-2019

What do we know about the subject matter of this study?

Bednar tumor or pigmented dermatofibrosarcoma protuberans is a very rare tumor where the treatment of choice is the complete surgical resection with clear margins to reduce the recurrence rate.

What does this study contribute to what is already known?

We present a pediatric case in which, as a therapeutic strategy, a variant of Mohs micrographic surgery is performed and coverage of the defect using a skin substitute dressing.

Abstract

Bednar tumor is a rare low-grade sarcoma considered the pigmented variant of dermatofibrosarcoma protuberans (DFSP). **Objective:** To describe the clinical and histopathological characteristics, treatment and evolution of this rare neoplasm. **Clinical Case:** A 9-year old female presented with a 2-year history of an indurated, asymptomatic papule on the back of her fourth left toe. The incisional biopsy was compatible with pigmented DFSP. The immunohistochemical study showed intense positivity for CD34 throughout the lesion, with negative factor XIIIa. We complemented the study with molecular cytogenetics (FISH) for PDGFB gene (22q13.1) which showed an abnormal pattern in tumor cells, but not in the melanocytes or the peritumoral skin. Delayed Mohs surgery and skin substitute dressing were performed without neoplastic recurrence at 5 years of follow up. **Conclusion:** Pigmented DFSP is a low-grade sarcoma that is very rare in pediatric patients. The classical and pigmented variants should be suspected in the presence of a single papulonodular lesion of slow and progressive growth, with presence of spindle cells with storiform pattern in the biopsy and positive immunohistochemical study for CD34. It is an entity with good prognosis, with little risk of recurrence and metastasis, if complete excision is achieved.

Keywords:
Dermatofibrosarcoma;
Mohs surgery;
Skin Neoplasm;
Skin;
Artificial;
Sarcoma

Correspondence:
Nieto-Benito, LM
lula.m.nieto@gmail.com

How to cite this article: Rev Chil Pediatr 2020;91(1):99-104. DOI: 10.32641/rchped.v91i1.1303

Introduction

Dermatofibrosarcoma protuberans (DFSP) is a slow-growing and locally aggressive connective tissue neoplasm, which gives it a significant but rarely metastatic tendency to recur[1]. It is considered a low-grade tumor that accounts for less than 2% of all sarcomas[2], most often occurring between the second and fifth decade of life. There are three series of DFSP cases in pediatric age, 13 patients in a series in Madrid in 11 years of study[3], 17 cases in 10 years of follow-up in a Canadian center[4], and a third American publication that includes 452 cases diagnosed in a period of 37 years[5], reflecting the low prevalence of this entity in childhood. In studies with a higher number of patients, there was observed an incidence in children of 0.8 to 5 cases per million population per year[6], an even lower incidence than in adults.

Pigmented DFSP initially appears as a skin-colored, brown or violet papule, which develops into a slow-growing, painless plaque or tumor that progressively results in a multinodular protruding mass[1,2]. It can occur in any location, although the most frequent is in the trunk, specifically in the dorsal region and shoulders. It is an initially dermal tumor, which, over time, infiltrates deeply, affecting subcutaneous cellular tissue, fascia, muscle, and even bone.

The first description of the pigmented DFSP was published by Bednar in 1957 as 'storiform neurofibromas'[7]. This variant represents between 1 and 5% of DFSP cases[8,9] and shares the clinical, epidemiological, histopathological, and prognostic characteristics of the classical variant[9]. Its etiology is not yet clearly established. It is proposed that the origin of the Bednar tumor is from the melanocytic colonization of a DFSP[8,9].

The delay in the diagnosis of this pathology is frequent, especially in the pediatric age, thus a high degree of suspicion is needed for diagnosing it. The treatment of choice is complete resection of the lesion, using Mohs surgery or conventional surgery with wide margins, which allows a decrease in the recurrence rate.

There is a lack of experience in pediatric DFSP and it is based on published isolated clinical cases[10]. The objective of this paper is to describe the clinical and histopathological characteristics, treatment, and evolution of a pediatric case of this infrequent neoplasm.

Clinical Case

9-year-old female schoolchild with no relevant medical-surgical history was referred to our center due to a two-year history of an indurated and asymptomatic papule, located on the back of the fourth left toe. There was in the center of the lesion a purple-brown area surrounded by an erythematous border. The whole lesion was 8 mm in its longest diameter (Figure 1).

A soft tissue ultrasound was performed, which showed non-specific results, thus a diagnostic incisional biopsy was performed. Histologically, a proliferation was observed centered in the dermis, with extension to the subcutaneous cellular tissue, affecting the fat lobules by the tumor infiltrate. The epidermis was not affected. The tumor was made up of small cells, with fusiform nuclei and scarce cytoplasm, arranged in fascicles with a storiform pattern, in which the elongated cells appeared with a swirl-like shape between the collagen bundles.

The immunohistochemical study showed intense positivity for CD34 throughout the lesion, with negative factor XIIIa (Figure 2). In the proliferation thickness, there were few mitotic figures and large dendriform cells without atypia, presenting isolated positivity for S-100, HMB-45, and Melan-A.

The histological study was complemented using the FISH technique for detecting the PDGFB gene (22q13.1) which showed an abnormal tumor-cell pattern, but not in the melanocytes or peritumoral skin.
Once madding the diagnosis of pigmented DFSP, a staging study was performed which included blood and urine cultures, chest X-ray and CT scan imaging, abdominal and pelvic ultrasound, MRI of the lower limb and left foot. No studies showed relevant findings, ruling out distant metastasis.

The lesion was completely resected using a variant of Mohs micrographic surgery (90º incision) and initial coverage with Integra® Wound Dressing, which allowed the granulation tissue formation for placing a partial thickness graft in a second surgery, with minimum esthetic sequelae (Figure 3).

Since then, the patient has undergone multidisciplinary follow-up by the pediatric departments of oncology and hematology, plastic surgery, and dermatology of our center. Periodic clinical and radiological monitoring has been carried out, based on the recommendations of international clinical guidelines[11,12] which recommend quarterly follow-up during the first year; every four months during the second and third year; semi-annual up to the fifth year, and recommended annual follow-up up to ten years after diagnosis. In our case, the patient has completed a five-year follow-up, with no recurrence or appearance of distant disease after complete resection of the lesion.

Discussion

The clinical presentation of DFSP in childhood is similar to that of adulthood. They are usually asymp-

tomatic lesions, with an average size of 1-5 cm at diagnosis[13], characterized by gradual growth, as in our case.

There is a variant of congenital DFSP, an even rarer entity, which often goes unnoticed and is diagnosed months or years after birth. In the congenital form, there are three clinical patterns of presentation[14], the first one as an infiltrated plaque, the second one as a sclerotic plaque (morphea-like), and the last one as an atrophic plaque (anetodermia-like). All of them, if allowed to grow, may progressively increase in size to the usual clinical presentation[15].

The clinical differential diagnosis of DFSP in childhood should include tumors and vascular malformations, keloids, scars, cystic hygromas, infantile myofibroma, pilomatrixoma, and clinically and historically, dermatofibroma, cellular blue nevus, fibrosarcoma, rhabdomyosarcoma, and malignant melanoma[16,17]. Therefore, any tumor or nodular lesion, of progressive growth and prolonged evolution, which does not spontaneously resolve, should be studied to rule out malignancy.

In the histopathological study, macroscopically, the DFSP appears as a single, well-delimited mass located in the dermis. Microscopically, its appearance is like a well-defined fibrosarcoma, with a proliferation of small, spindle-shaped cells with low pleomorphism and low mitotic activity[18]. The stroma has variable amounts of collagen fibers and capillaries. Tumor cells

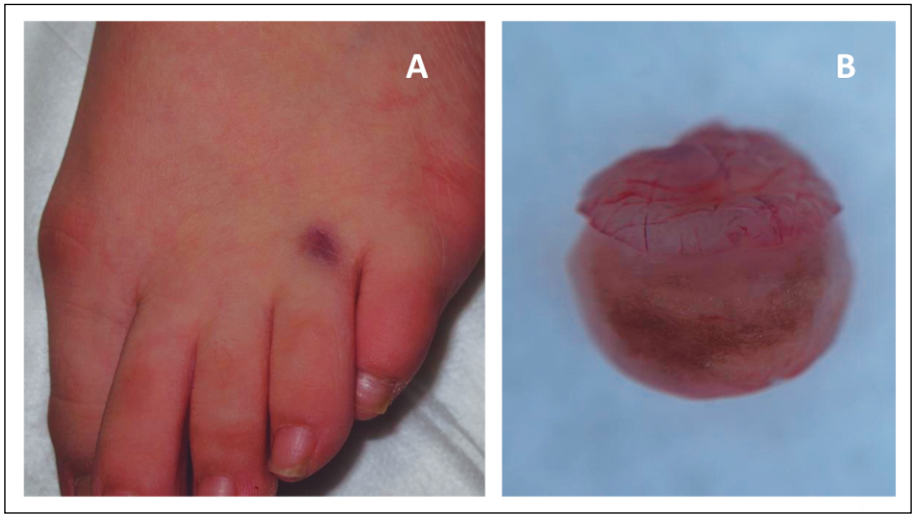

Figure 1. A) Clinical image: violet papule on the back of the fourth left toe. **B)** Ex vivo dermoscopy after incisional biopsy: presence of pigment in the dermis and subcutis, different from what is observed in a melanocytic lesion (blue-gray pigment in the dermis).

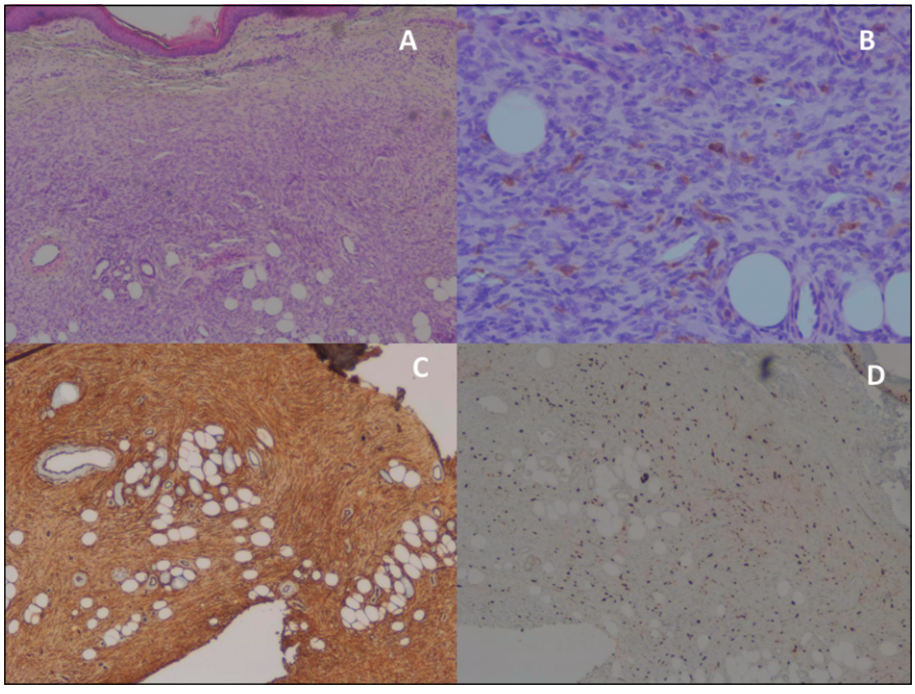

Figure 2. Histopathology: **A)** Proliferation in the dermis sparing epidermis, (x10, H&E). **B)** High power magnification: fusiform nuclei, scarce citoplasm and monomorfous cells, arranged in a storiform pattern, mixed with elongated, pigmented and dendritiform, typical, melanocytes. Inmunohistochemistry. **C)** CD34: positive staining. **D)** S-100: isolated positivity in the melanocytic component.

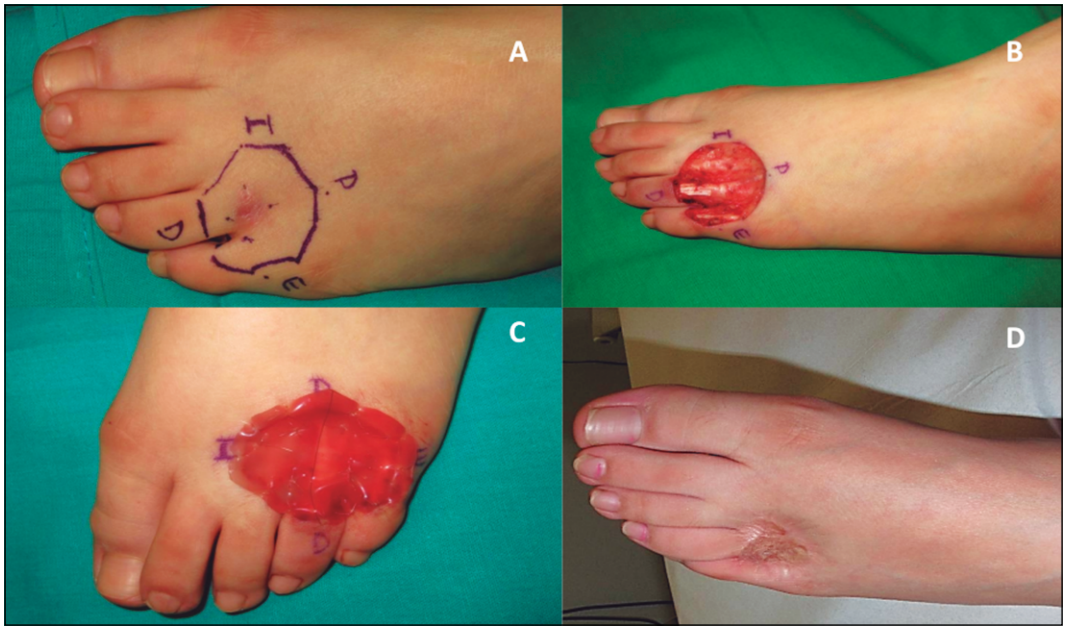

Figure 3. A) Mohs micrografic surgery planning: 90 degrees incisión variant. **B)** Primary defect after resection of the tumor. **C)** Coverage with Integra® Wound Dressing. **D)** Clinical result, with minimum esthetic sequelae, 2 years after surgery.

are grouped into short irregular fascicles, which form a storiform pattern, similar to that observed in the classic variant of dermatofibrosarcoma, but with the presence of melanocytes dispersed among the spindle cells as a characteristic of the pigmented one[18], as showed the histopathological study of our case. The main tumor component presents a greater density in its central part, from where it projects infiltration to the subcutaneous cellular tissue, producing the so-called 'honeycomb' pattern.

CD34 is the most useful immunohistochemical marker for distinguishing DFSP from other fibrohistiocytic tumors[19]. The pigmented DFSP shows intense positivity in all spindle tumor cells for CD34 (XIIIa negative) and isolated positivity for S-100 and HMB-45 in the melanocytic component of the pigmented form.

Variants of dermatofibroma (DF), such as cellular or deep dermatofibroma, can be differentiated from DFSP through this technique since these entities are CD34 negative and XIIIa positive[19,20]. Schwannomas and neurofibromas present very strong positivity for S-100; leiomyomas and leiomyosarcomas are positive for multiple smooth muscle markers (actin, desmin, and vimentin), and the presence of positivity across the lesion for S-100, HBM-45 and Melan-A suggests a melanoma. All of these entities are CD34 negative.

Cytogenetic studies show the presence of a translocation between chromosomes 17 and 22 in up to 95% of DFSPs, including their pigmented variant[20], as occur in our case. This translocation results in the production of the COL1A1-PDGFB fusion protein (collagen type I alpha 1 and beta receptors for platelet-derived growth factor) generating the constitutive activation of this receptor and the uncontrolled growth of connective tissue cells, resulting in neoplasia. In the published cases of DFSP with the COL1A1-PDGFB fusion gene, the location of the cut-off point of the PDGFB gene is constant in exon 2, however, that of the COL1A1 gene is highly variable. To date, DFSP is the only tumor in which this specific somatic translocation has been demonstrated[20,21].

The treatment of choice is a complete surgical resection which is difficult due to the asymmetric and infiltrative growth of the tumor. Mohs surgery is the technique of choice[22,23], however, in case of having to resort to conventional surgery, wide margins (2 to 4 cm) should be ensured. In our case, a variant of micrographic surgery with a 90º incision was performed (since by definition this technique is practiced at 45º), with the intention of ensuring margins on all skin planes (epidermis, dermis, and hypodermis). Likewise, the defect was covered in the first surgery with a skin substitute that allowed the use of a partial thickness skin graft in a second procedure that improved the final esthetic result and probably decreased the possible complications of the graft if it had been placed in the same surgical time as the removal.

Incomplete resection is associated with a high rate of recurrence, reported in up to 20-50% of adults, and with metastatic disease, reported in 4-5% of adult patients[8]. The higher the number of interventions and the longer the delay in completely resecting the lesion, the higher the risk of recurrence. For a better characterization of the prognosis and evolution of DFSP in children, long-term studies are needed, which have not

been carried out until now, probably due to the low incidence of this tumor.

Conclusions

Pigmented DFSP is a variant of DFSP, a very uncommon low-grade sarcoma, which very rarely occurs in pediatric patients, as in our case. The classic and pigmented variants should be suspected in the presence of a single papulonodular lesion, of slow and progressive growth, with the presence of spindle cells with a storiform pattern in the biopsy and with a positive immunohistochemical study for CD34. The surgical treatment is Mohs surgery, which is the technique of choice. If the lesion is completely resected, this entity has a good prognosis, with little risk of recurrence and metastasis.

Ethical Responsibilities

Human Beings and animals protection: Disclosure the authors state that the procedures were followed according to the Declaration of Helsinki and the World Medical Association regarding human experimentation developed for the medical community.

Data confidentiality: The authors state that they have followed the protocols of their Center and Local regulations on the publication of patient data.

Rights to privacy and informed consent: The authors have obtained the informed consent of the parents (tutors) of the patients and/or subjects referred to in the article. This document is in the possession of the correspondence author.

Conflicts of Interest

Authors declare no conflict of interest regarding the present study.

Financial Disclosure

Authors state that no economic support has been associated with the present study.

References

1. Añón-Requena MJ, Pico-Valimaña M, Muñoz-Arias G. Tumor de Bednar (dermatofibrosarcoma protuberans pigmentado). Actas Dermosifiliogr. 2016;107:618-20.
2. Thway K, Noujaim J, Jones RL, Fisher C. Dermatofibrosarcoma protuberans: pathology, genetics, and potential therapeutic strategies. Ann Diagn Pathol. 2016;25:64-71.
3. Valdivielso-Ramos M, Torrelo A, Campos M, Feito M, Gamo Reyes, Rodriguez-Peralto J. Pediatric Dermatofibrosarcoma Protuberans in Madrid, Spain: multi-institutional Outcomes. Pediatr Dermatol 2014;31:676-82.
4. Posso-De los Ríos C, Lara-Corrales I, Ho N. Dermatofibrosarcoma Protuberans in pediatric patients: a report of 17 patients. J Cutan Med Surg. 2014;18:180-5.
5. Rubio GA, Alvarado A, Gerth DJ, Tashiro J, Thaller SR. Incidence and Outcomes of Dermatofibrosarcoma Protuberans in the US Pediatric Population. J Craniofac Surg. 2017;28:182-4.
6. Monier D, Vidal C, Martin L. Dermatofibrosarcoma protuberans: a population-based cancer registry descriptive study of 66 consecutive cases diagnosed between 1982 and 2002. J Eur Acad Dermatol Venereol. 2006;20:1237-42.
7. Bednar, B. Storiform neurofibromas of the skin, pigmented and nonpigmented. Cancer 1957;10:368-76.
8. Zeitouni N, Cavanaugh K, DuPont J. Dermatofibrosarcoma Protuberans: an update and Review. Curr Derm Rep. 2015;4:195-204.
9. Kreicher KL, Kurlander DE, Gittleman HR, Barnholtz-Sloan JS, Bordeaux JS. Incidence and Survival of Primary Dermatofibrosarcoma Protuberans in the United States. Dermatol Surg. 2016;42:S24-31.
10. Tsai YJ, Lin PY, Chew KY, Chiang YC. Dermatofibrosarcoma protuberans in children and adolescents: Clinical presentation, histology, treatment, and review of the literature. J Plast Reconstr Aesthet Surg. 2014;67:1222-9.
11. National Comprehensive Cancer Network. NCNN Clinical Practice Guidelines in Oncology (NCCN Guidelines): Dermatofibrosarcoma Protuberans (Version 1.2016).
12. Ugurel S, Kortmann RD, Mohr P, et al. S1 guidelines for dermatofibrosarcoma protuberans (DFSP) - update 2018. J Dtsch Dermatol Ges. 2019;22.
13. Kaburagi Y, Hatta N, Kawara S, Takehara K. Pigmented Dermatofibrosarcoma protuberans (Bednar Tumor) Occurring in a Japanese Infant. Dermatology 1998;197:48-51.
14. Han HH, Lim SY, Park YM, Rhie JW. Congenital Dermatofibrosarcoma Protuberans: A Case Report and Literature Review. Ann Dermatol. 2015;27:597-600.
15. Dupree WB, Langloss JM, Weiss SW. Pigmented dermatofibrosarcoma protuberans (Bednar tumor): A pathologic, ultrastructural and immunohistochemical study. Am J Surg Pathol. 1985;9:630-9.
16. McAllister J, Recht B, Hoffman T, Uma S. CD34+ pigmented fibrous proliferations: The morphologic overlap between pigmented dermatofibromas and Bednar tumors. Am J Dermatopathol. 2008;30:484-7.
17. Mentzel T. Fibrohistiocytic tumors of the skin: a heterogeneous group of superficially located mesenchymal neoplasms. Pathologe. 2015;36:79-88.
18. Shah KK, McHugh JB, Folpe AL, Patel RM. Dermatofibrosarcoma protuberans of distal extremities and acral sites: a clinicopathologic analysis of 27 cases. Am J Surg Pathol. 2018;42:413-9.
19. Cohen PR, Rapin RP, Farhood AI. Dermatofibroma and dermatofibrosarcoma protuberans: differential expression of CD34 and factor XIIIa. Am J Dermatopathol.

1994;16:573-4.

20. Llombart B, Sanmartín O, López-Guerrero JA, et al. Dermatofibrosarcoma protuberans: Clinical, pathological, and genetic (COL1A1-PDGFB) study with therapeutic implications. Histopathology. 2009;54:860-72.
21. Serra-Guillén C, Llombart B, Sanmartín O. Dermatofibrosarcoma protuberans. Actas Dermosifiliogr. 2012;103:762-77.
22. Barysch MJ, Weibel L, Neuhaus K, et al. Dermatofibrosarcoma protuberans in childhood treated with slow Mohs micrographic surgery. Pediatr Dermatol. 2013;30:468-8.
23. Wiesmueller F, Agaimy A, Perrakis A, Arkudas A, Horch RE, Grützmann R et al. Dermatofibrosarcoma protuberans: surgical management of a challenging mesenchymal turor. World J Surg Oncol. 2019;17:90.