

JAMA Dermatology Clinicopathological Challenge

Skin-Colored Nodule on the Scalp of a Middle-Aged Man

Geeti Khullar, MD, DNB; Deepti Agarwal, MD; Mithilesh Chandra, MD



Figure. A, Clinical photograph shows a 2 × 1.5-cm skin-colored nodule on the occiput. B, Epidermis is unremarkable. A nodular lesion surrounded by a fibrous capsule is seen in the dermis with cross-sections of many parasites along with pink material in the nodule (hematoxylin-eosin, original magnification ×2). C, The parasite morphology depicts a thick cuticle, well-developed inner muscular layer, tubular structures containing microfilariae, and necrotic debris (hematoxylin-eosin, original magnification ×20). D, Higher magnification shows spinous processes on the outer surface of the cuticle (hematoxylin-eosin, original magnification ×20).

An otherwise healthy man in his 40s presented with a 3-month history of an asymptomatic nodule on his scalp. There were no systemic complaints, history of arthropod bite, immunosuppression, travel abroad, or contact with animals in the recent past. Physical examination revealed a skin-colored, firm, nontender, freely mobile 2 × 1.5-cm nodule with overlying normal skin on the right occipital region of the scalp (Figure, A). There was no lymphadenopathy. No other cutaneous lesions were present.

The nodule was completely excised and sent for histopathologic examination, which revealed a nodule in the dermis with an unremarkable epidermis. Cross-sections of parasites were present, surrounded by a fibrous capsule (Figure, B). The parasite showed an outer cuticle, muscle layer underneath, and gravid uterus filled with microfilariae (Figure, C). The cuticle demonstrated a wavy pattern of longitudinal ridges on its outer surface (Figure, D). The fibrous capsule contained mixed inflammatory infiltrate of lymphocytes, eosinophils, histiocytes, and plasma cells. Findings of slitlamp examination and funduscopy of the eyes were normal. Findings of routine hematologic and biochemical investigations were normal. No microfilaria was seen in peripheral blood. Findings of chest radiography and abdomen ultrasonography were unremarkable.

WHAT IS YOUR DIAGNOSIS?

- A. Onchocercoma
- B. Subcutaneous dirofilariasis
- C. Cutaneous loiasis
- D. Subcutaneous hydatid cyst

Diagnosis

B. Subcutaneous dirofilariasis

Discussion

Subcutaneous dirofilariasis is a zoonotic infection caused by filarial nematode *Dirofilaria*, a natural parasite of dogs, cats, and wild animals. It is mostly reported in South America, Europe, Southeast Asia, and Africa.^{1,2} The dog parasite *Dirofilaria repens* is the most common agent for human infections acquired accidentally by the bite of mosquitoes of the genera *Culex*, *Aedes*, and *Anopheles*.¹ Clinical forms include pulmonary, subcutaneous, and ocular disease.³ Subcutaneous dirofilariasis presents as an occasionally migratory nodule that may be painful or itchy, distributed on the face (especially periorbital and subconjunctival), chest wall, upper arm, thigh, and male genitalia.¹⁻³ As the adult female worm does not reach maturity in skin, microfilariae usually are not seen in blood. However, microfilariae have been reported in subcutaneous tissue.⁴ Diagnosis is usually established on macroscopic analysis of the parasite morphology or microscopic examination of histologic sections from the nodule. Excision of the nodule is both diagnostic and therapeutic. Adult worms have a multilayered thick-walled cuticle with longitudinal ridges and transverse striations, which appear as regularly spaced, round, elevated structures about 10 to 12 μm apart, and a well-developed muscular layer. Adult worms are 50 to 170 μm long and 370 to 650 μm wide.¹ Polymerase chain reaction has been used in skin, eye, and pulmonary specimens for species confirmation and where histomorphology is inconclusive.⁵⁻⁷ Peripheral eosinophilia is an inconsistent finding. Antibody detection using enzyme-linked immunosorbent assay is of little diagnostic value owing to low sensitivity and specificity.¹ Slitlamp examination and chest radiograph should be performed to rule out ocular and pulmonary involvement, respectively.

Onchocerciasis is caused by filarial nematode *Onchocercus volvulus*, which is transmitted by the bite of the black fly of the genus *Simulium*. The infection is endemic in Africa, Latin America, and Yemen.⁸ It is characterized by cutaneous, ocular, and systemic manifestations. Cutaneous findings include pruritus, onchocercomas, onchodermatitis, atrophy, and depigmentation. Onchocercoma is a

firm, painless, mobile subcutaneous nodule, predominantly distributed on the head, face, and shoulders. Diagnosis is made by microscopic examination of skin snips for motile microfilariae. Histopathology of the nodule reveals worms embedded in hyaline connective tissue with a surrounding mixed inflammatory infiltrate. The adult worm is 19 mm to 50 cm long and 130 to 400 μm in diameter. The cuticle is thick with prominent annular ridges on the external surface and transverse striations in the underlying layer. The muscular coat is poorly developed. The female worm produces microfilariae, which are 220 to 360 μm long, 5 to 9 μm wide, and unsheathed.¹

Loiasis is caused by the filarial nematode *Loa loa* and transmitted by the bite of the *Chrysops* fly. It is endemic in Africa and presents as transient, migratory, painless, pruritic subcutaneous swellings, known as Calabar swellings, on the limbs near the joints.² Adult worms can also migrate across the subconjunctival tissue of the eyes. Diagnosis is established on demonstration of microfilariae on a daytime Giemsa-stained blood smear or adult worms from subcutaneous or ocular tissue.² The adult worm measures 30 to 70 mm in length and 0.35 to 0.5 mm in diameter. The cuticle of female worms has randomly arranged, smooth, round thickenings except at the head end. Microfilariae are sheathed and measure 250 to 300 μm by 6 to 8 μm .^{1,2}

Hydatid disease is caused by the larval stage of *Echinococcus granulosus*. Humans acquire infection after ingestion of eggs in contaminated food transmitted via feces of dogs or sheep. It commonly affects the lungs and liver; rarely, skin may be involved. Primary subcutaneous hydatid cyst presents as a painless subcutaneous swelling commonly on the thigh and less frequently on head and neck.⁹ Histologically, the innermost germinal layer is nucleated, gives rise to brood capsules attached by a stalk, and contains daughter cysts and protoscolices. Beneath this layer is the acellular avascular eosinophilic chitinous laminated membrane and the outer adventitial layer consisting of fibrovascular tissue with lymphocytes and histiocytes.⁹ The present case emphasizes that dirofilariasis should be considered as a differential diagnosis for a subcutaneous nodule, particularly in endemic areas, and histopathologic examination is crucial to confirm the diagnosis.

ARTICLE INFORMATION

Author Affiliations: Department of Dermatology and Sexually Transmitted Diseases, Vardhman Mahavir Medical College and Safdarjung Hospital, New Delhi, India (Khullar); Pathology Consultancy Services B-6, Sector 27, Noida, Uttar Pradesh, India (Agarwal, Chandra).

Corresponding Author: Geeti Khullar, MD, DNB, Department of Dermatology and Sexually Transmitted Diseases, Vardhman Mahavir Medical College and Safdarjung Hospital, New Delhi-110029, India (geetikhullar@yahoo.com).

Published Online: September 23, 2020.
doi:10.1001/jamadermatol.2020.3527

Conflict of Interest Disclosures: None reported.

Additional Contributions: We thank the patient for granting permission to publish this information.

Self-assessment Credit: This article is eligible for journal-based self-assessment (1 credit) for Maintenance of Certification (MOC) from the

American Board of Dermatology (ABD). After completion of an activity, please log on to the ABD website at www.abderm.org to register your credits. This may be done after each exercise or after accumulating many credits.

REFERENCES

1. Tzanetou K, Gogou C, Giannouloupolous A, Patralexis C, Fragia K. Fibrous subcutaneous nodule caused by *Dirofilaria repens*. *Travel Med Infect Dis*. 2009;7(5):318-322.
2. Lupi O, Downing C, Lee M, et al. Mucocutaneous manifestations of helminth infections. *J Am Acad Dermatol*. 2015;73(6):929-944.
3. Sukumarakurup S, Payyanadan BM, Mariyath R, Nagesh M, Moorkoth AP, Ellezhuthil D. Subcutaneous human dirofilariasis. *Indian J Dermatol Venereol Leprol*. 2015;81(1):59-61.
4. Damle AS, Irvane Bajaj JA, Khaparkhantkar MN, Maher GT, Patil RV. Microfilaria in human subcutaneous dirofilariasis. *J Clin Diagn Res*. 2014;8(3):113-114.
5. Nazar N, Lakshmanan B, Jayavardhanan KK. Molecular characterization of human *Dirofilaria* isolates from Kerala. *Indian J Med Res*. 2017;146(4):528-533.
6. Montesel A, Bendinelli A, Figus M, Posarelli C. There is a worm in my eye! *Eur J Ophthalmol*. 2019;29(5):NP5-NP8.
7. Ferrari PA, Grisolia A, Reale S, Liotta R, Mularoni A, Bertani A. A rare case of human pulmonary dirofilariasis with nodules mimicking malignancy. *J Cardiothorac Surg*. 2018;13(1):65.
8. Okulicz JF, Stibich AS, Elston DM, Schwartz RA. Cutaneous onchocercoma. *Int J Dermatol*. 2004;43(3):170-172.
9. Khullar G, Agarwal D, Chandra M. Solitary subcutaneous nodule in the preauricular region. *Int J Dermatol*. 2020;59(2):173-174.