

ONLINE FIRST

Delusional Infestation, Including Delusions of Parasitosis

Results of Histologic Examination of Skin Biopsy and Patient-Provided Skin Specimens

Sara A. Hylwa, BS; Jessica E. Bury, MD; Mark D. P. Davis, MD; Mark Pittelkow, MD; J. Michael Bostwick, MD

Objective: To review the results of skin biopsies and patient-provided specimens from patients whose assessment was consistent with delusional infestation, including delusions of parasitosis.

Design: Retrospective medical record review.

Setting: Mayo Clinic, Rochester, Minnesota.

Patients: The study population comprised all patients who were seen at Mayo Clinic and had a diagnosis of delusional skin infestation, including delusions of parasitosis, between 2001 and 2007, and who underwent biopsies as part of their dermatologic evaluations or brought samples to their clinical consultations.

Main Outcome Measures: The results of examination of these biopsy and patient-provided specimens.

Results: A total of 108 patients met inclusion criteria for this study: 80 received biopsies, 80 had self-procured skin specimens, and 52 patients received biopsies and provided specimens. No biopsy specimen (0 of 80) provided

evidence to support skin infestation. The most common interpretations in the 80 biopsy specimens were dermatitis in 49 of 80 (61%); excoriation, ulceration, or erosion in 38 (48%); and nonspecific dermal inflammation in 25 (31%). Patient-provided specimens were most frequently assessed by the physician (generally a dermatologist) evaluating the patient, although 20 of the 80 samples (25%) were submitted for pathologic evaluation. Of these 80 specimens, 10 (13%) contained insects. All but 1 of the insects were noninfesting varieties; 1 (1%) was a pubic louse. The remaining findings consisted of cutaneous debris, environmental detritus, or plant material.

Conclusion: In patients with suspected delusional infestation, neither skin biopsies nor examination of patient-provided specimens provided objective evidence of skin infestation.

Arch Dermatol. 2011;147(9):1041-1045.

Published online May 16, 2011.

doi:10.1001/archdermatol.2011.114

DELUSIONAL INFESTATION¹ is a dermatopsychiatric condition characterized by patients' fixed and false belief that their skin is infested by pathogens. Descriptions of these irritants in the literature have included an

tation encompasses both animate and inanimate materials.

While patients with delusional infestation commonly produce tangible specimens as proof of infestation,¹⁰ to our

*See Practice Gaps
at end of article*

Author Affiliations: Visiting Medical Professional for Research, Department of Dermatology (Ms Hylwa), Mayo Medical School, College of Medicine (Dr Bury), and Departments of Dermatology (Drs Davis and Pittelkow) and Psychiatry and Psychology (Dr Bostwick), Mayo Clinic, Rochester, Minnesota.



CME available online at
www.jamaarchivescme.com

assortment of materials. Most common are animate beings such as insects,^{2,3} worms,^{3,4} viruses,⁴ fungi,⁵ and bacteria.⁶⁻¹² Numerous inanimate materials, such as wood chips,⁷ fibers,^{8,9} and little tubes,⁹ have also been described. The term *delusional infes-*

knowledge, no published studies have objectively examined these specimens. Moreover, although delusional infestation has been called an "easy" diagnosis,¹¹ many patients undergo skin biopsies, even though no study has evaluated their utility. To address this deficit in the literature, we retrospectively reviewed the results of physician-obtained biop-

sies and patient-provided specimens from patients presenting with suspected delusional infestation at Mayo Clinic, Rochester, Minnesota.

METHODS

IDENTIFICATION OF PATIENTS WITH DELUSIONAL INFESTATION

A computerized search of patients seen at Mayo Clinic's site in Rochester, from 1996 through 2007, was performed using the following search terms: *delusion of lice, delusional disorder with parasitosis, delusion(s) of parasitosis, delusional parasitosis, delusion(s) of parasitism, delusion(s) of parasites, parasitosis (delusional), delusional infestation, delusory parasitosis, psychogenic parasitosis, neurogenic parasitosis, neurotic parasitosis, Ekbom syndrome, formication and parasites, chronic tactile hallucination(s), dermatophobia, parasitophobia, toxic psychosis, tactile psychosis, monosymptomatic hypochondriacal psychosis, Morgellon(s), psychogenic dermatitis, neurotic dermatitis, neurogenic dermatitis, self-induced excoriations, and psychogenic excoriations*. Because complete electronic records were available beginning in 2001, the search dates were refined to 2001 through 2007. An initial reading was performed so that patients erroneously included by the broad search were discarded. Two reviewers (S.A.H. and J.E.B.) assessed all remaining medical records in full.

CASE DEFINITION

All patients who were seen at Mayo Clinic and whose final assessment was consistent with the criteria for diagnosis of delusional skin infestation as described by Freudenmann and Leping¹² were identified as having the disorder and were evaluated for inclusion in this study. The 2 inclusion criteria were (1) the patient's conviction that he or she was being infested by pathogens (animate [eg, insects or worms] or inanimate [eg, fibers]) without any medical or microbiological evidence for this, ranging from overvalued ideas to a fixed, unshakable belief; and (2) the patient's complaint of abnormal sensations in the skin explained by the first criterion. When a diagnosis was uncertain, the case was discussed between the reviewers and a final decision to include or exclude the patient was agreed between them.

The general term *delusional infestation* was chosen because it embraces the 2 main categories in which patients present: delusions that they are infested with animate material (such as parasites) and delusions that they are infested with inanimate material (such as fibers).

All patients seen between 2001 and 2007, who met the criteria for delusional skin infestation and who had received a skin biopsy, brought a specimen with them to be examined, or both, were included in this study. In regard to the biopsy results, dermatitis was defined as epidermal, the histologic hallmark being the presence of intercellular edema (spongiosis) and exostosis, varying degrees of epithelial proliferation, and dermal changes (edema or perivascular inflammation). (The relative proportions of these skin changes varied to some extent with the subtype and stage of evolution of the disease.)

This study was approved by the Mayo Clinic Institutional Review Board. All patients studied had signed a waiver releasing their medical records for use in research.

RESULTS

Of 147 patients identified as having delusional skin infestation, 108 (73%) met the inclusion criteria for this study. Of the 108 patients included in the study, 80 re-

ceived biopsies, 80 brought specimens, and 52 had both. Eighty-one patients (75%) were female. Mean symptom duration was 2.3 years (range, 2 weeks to 23 years). Patients believed that they were infested by animate and inanimate materials. Fifty patients (46%) complained of more than 1 type of infesting material. Animate materials reported to be infesting the skin included bugs (85 [79%]), worms (22 [20%]), and eggs (species unspecified) (3 [3%]). Inanimate materials reported to be infesting the skin included fibers (24 [22%]), "specks" (8 [7%]), "triangles" (2 [2%]), gravel or grainlike material (2 [2%]), and 1 each (1%) of the following: rose thorns, splinters, rotting wood fungus, Styrofoam-like material, glass, car oil, retained foreign object (nail), and gel.

Data concerning physician-obtained biopsy specimens are summarized in **Table 1**. No biopsy revealed evidence of infestation. More than half the patients showed evidence of dermatitis on biopsy. Other objective tests, such as cultures and ova and parasite (O&P) data, are also outlined in Table 1.

The data concerning patient-provided specimens are summarized in **Table 2**. One specimen contained a true parasite (pubic louse). Insects found within specimens were all provided by patients who were primarily concerned with insect infestation on presentation; no patients with sole beliefs of inanimate infestation brought insects to their appointments.

COMMENT

Very little data in the literature describe the results of physician-obtained biopsy specimens or patient-provided specimens in patients presenting with delusional infestation (including delusions of parasitosis). Much of the published data regarding biopsies and specimens are derived from case reports and small case series, a summary of which can be found in the eTable (<http://www.archdermatol.com>).^{3,4,8,9,13-51} The data in this study provide objective analysis of the skin material presented. The analysis of the biopsy specimens is particularly objective because a pathologist interpreted the tissue independent of the patient and the patient's clinical presentation.

In this study, none of the documented biopsy or patient-provided specimens revealed evidence of infestation. This is consistent with multiple previously published case reports, with the exception of true infestations reported in 2 patients initially thought to be delusional (eTable).^{21,23}

This study is important for patients. Patients frequently believe that physicians are dismissive of their concerns and are not examining their skin closely enough, and therefore patients request that more testing be performed. This study found that biopsy results do not change a physician's clinical diagnosis of delusional infestation.

DISCUSSION OF RESULTS

Biopsy Results

The source of the biopsy specimen correlated with the patient's complaint: patients with delusional skin infes-

Table 1. Biopsy Data and Results^a

Characteristic	Total
Patients with biopsies, No.	80
Biopsies, No.	121
Patients with 1 biopsy, No.	80
Patients with 2 biopsies, No.	33
Patients with 3 biopsies, No.	8
Patients with evidence of infestation in biopsy specimen, No. (%)	
Yes	0
No	80 (100)
Biopsy sources	
Skin	117 (97)
Tongue	2 (2)
Hair	1 (1)
Muscle	1 (1)
Biopsy results	
Dermatitis	49 (61) ^b
Chronic dermatitis	33
Subacute dermatitis	10
Lichen simplex chronicus	6
Excoriation/ulceration/erosion	38 (48)
Nonspecific dermal inflammation	25 (31)
Healing skin	20 (25)
Prurigo nodule	6 (8)
Folliculitis	5 (6)
Perifollicular inflammation	2 (3)
Milium	2 (3)
Plant matter	2 (3)
Normal skin	2 (3)
Other findings ^c	
Culture data	
Acid-fast tests, No.	8
Positive	0
Negative	8 (100)
Mycobacterial tests, No.	9
Positive	0
Negative	9 (100)
Fungal tests, No.	19
Positive	4 (21)
Negative	15 (79)
Bacterial (skin) tests ^d	
Patients	20 (25)
Skin sites, No. ^d	31
Positive	23 (74)
Negative	8 (26)
Viral tests, No.	1
Positive (herpes simplex virus)	1 (100)
O&P data	
Stool, No.	
Positive (<i>Chilomastix mesnili</i>)	1
Negative (1 patient had an earthworm in their sample)	28
Sputum, No.	
Negative	1
Muscle, No.	
Negative	1

Abbreviation: O&P, ova and parasite.

^aValues are given as number (percentage) unless indicated otherwise.

^bPercentages are based on the 80 patients with delusional infestation who received biopsies.

^cBiopsy diagnoses made only once: actinic keratosis, seborrheic keratosis, granuloma annulare, chronic hyperkeratosis with associated marked actinic elastosis, Grover disease, fibrosis and mixed dermal and pannicular inflammation with lipophagic fat necrosis, stasis dermatitis and lipodermatosclerosis, urticarial tissue reaction, reactive perforating collagenosis, linear focal elastosis, dermal abscess with fibrosis, psoriasisiform dermatitis, and normal hair shafts.

^dOne bacterial culture was performed on muscle tissue and was negative.

Table 2. Patient-Provided Specimen Data and Results^a

Characteristic	Total
Patients who presented specimens, No.	80
Specimen containers, No. ^b	
Bag	15
Tape	6
Glass slide	6
Petri dish	3
Envelope	2
Bottle/jar	2
Box	2
Paper towel	1
Index card	1
Test tube	1
Who viewed the specimens? ^c	
Dermatology	59 (74)
Pathology	20 (25)
Tropical medicine	3 (4)
Internal medicine	2 (3)
Psychiatry	2 (3)
Infectious disease	1 (1)
Specimen source ^d	
Skin	31 (39)
Hair	6 (8)
Stool	1 (1)
Not specified	43 (54)
Parasite in the specimen(s)?	
Yes ^e	1 (1)
No	78 (98)
Unknown (no comment)	1 (1)
Specific specimen findings	
Skin flakes	27 (34)
Scabs/serum crust	20 (25)
Hair	16 (20)
Textile fibers	14 (18)
Lint	13 (16)
"Debris"	8 (10)
Plant material	4 (5)
Dust	1 (1)
Wood	1 (1)
Cotton-tipped swab	1 (1)
Fibrous tissue	1 (1)
Insects	10 (13)
Fruit fly, No.	2
Louse, No. ^e	1
Mite, No.	1
Tick, No.	1
Not specified, No.	5
Only stated "not a parasite"	9 (11)
No comment regarding specimen	3 (4)

^aValues are given as number (percentage) unless indicated otherwise.

^bThirty-nine records included mention of the container.

^cSome specimens were viewed by multiple specialties.

^dOne patient brought in specimens from 2 sources.

^eAlthough pieces of what was believed to be a pubic louse were found in the patient-provided specimen, the physician did not believe this accounted for the patient's wide array of complaints, specifically nail and scalp issues.

tation received skin biopsies, 1 patient with prominent delusions of oral parasitosis received a tongue biopsy, and another patient concerned about a possible trichomonas infection received an excisional biopsy of muscle. No biopsy revealed evidence of infestation.

Interestingly, the majority of patients had some form of dermatitis, and almost half had excoriations, ulcerations, or erosions. The large number of dermatitis

diagnoses found by skin biopsy raises the possibility that a true pathologic condition may underlie delusional skin disease. Dermatitis is associated with itching and atypical skin sensations. This raises the possibility that atypical sensations in the skin may be precipitated by a true pathologic condition (eg, dermatitis or an underlying systemic disease that may result in dysesthesia) and interpreted mistakenly by the patient as insects crawling from the skin (in the case of delusions of parasitosis). When patients scratch their skin, excoriations are associated with cutaneous crusting and debris, which may be misinterpreted as pathogens emerging from the skin. One patient stated that she initially felt sensations of rectal itching and tingling, which were then replaced by crawling sensations and a belief that she was passing mucus, eggs, and “snake skin–like” opaque forms; a viral culture from her perianal area revealed herpes simplex virus.

Why would patients have a dermatitis? The dermatitis seen in biopsy results may have been irritant or allergic contact dermatitis: for example, many of the patients reported applying caustic material to their skin to get rid of the infesting materials, which could have led to an irritant or allergic contact dermatitis; rubbing and picking at the skin may have caused irritant contact dermatitis.

Cultures and Stool O&P Results

A number of patients had other objective tests performed, such as stool O&P testing, skin cultures, or both. One patient’s stool O&P test result revealed evidence of a nonpathogenic protozoan (*Chilomastix mesnili*), which could not account for the patient’s symptoms and for which no treatment was necessary. All other stool O&P test results were negative for parasites. No culture results changed a diagnosis from delusional infestation.

Patient-Provided Specimen Results

Although patient-provided specimens are historically referred to as the “matchbox sign,” no patient in our study provided a matchbox. Instead, plastic bags and other containers were most commonly used. We agree with the conclusions of other authors^{12,52} that the term *matchbox sign* is outdated. Perhaps the terms *specimen sign*¹² and *patient-provided specimens*—or, given the propensity for using plastic bags, the *Baggies sign*—would more accurately describe this behavior.

Patient-provided specimens were most frequently assessed by the physician evaluating the patient. Skin was cited most commonly as the specimen source, and correspondingly, specimens most often contained cutaneous debris: skin flakes, scabs, crusts, and hair. Interestingly, all insects provided in the specimens were brought by patients who had parasitic delusions.

None of the specimens presented by patients yielded evidence to change a diagnosis from delusional infestation. Although 1 specimen contained a true parasite (pubic louse), true infestation was not seen on the patient’s physical examination findings, and lice could not account for the patient’s numerous complaints, including extensive nail complaints. Similarly, although 1 patient brought in a tick, the tick could not account for the patient’s skin eruption.

STRENGTHS AND LIMITATIONS OF THE STUDY

To our knowledge, this is the first study that has addressed the histologic analysis of skin biopsy specimens and patient-provided specimens from a relatively large number of patients presenting with delusional infestation. Histologic examination of these specimens provides objective interpretations of what is occurring in a condition fraught with subjective perceptions.

This study is retrospective and has all the limitations of such studies; data may be incomplete, and data entry depends partly on the interpretation of the abstractors of information. Also, the cohort has disparate characteristics, with an array of presentations.

UNANSWERED QUESTIONS

The results of this study raise many questions concerning the value of skin biopsies in the context of a patient presenting with delusional infestation. Given that a skin biopsy and histologic examination of specimens brought by patients do not yield evidence of infesting materials, either animate or inanimate, should a biopsy be performed? Some have proposed that an alliance with a patient is a justification for a skin biopsy, but is it? What is the outcome following a biopsy? Did it improve the outcome of the interaction with the patient? Were patients more likely to be compliant with therapy following a biopsy? These questions remain unanswered by this study, which concentrated on the results of skin biopsies in this situation.

CONCLUSIONS

Although patients are convinced that their skin is infested with parasites or inanimate material, histologic examination of skin biopsy specimens and patient-provided specimens showed no evidence of skin infestation and did not change a clinical impression of the diagnosis. Intriguingly, the majority of skin biopsy results did show dermatitis, raising the possibility that skin inflammation and its attendant tactile discomfort might be the trigger provoking delusional symptoms in susceptible individuals.

Accepted for Publication: March 8, 2011.

Published Online: May 16, 2011. doi:10.1001/archdermatol.2011.114

Correspondence: Mark D. P. Davis, MD, Department of Dermatology, Mayo Clinic, 200 First St SW, Rochester, MN 55905 (davis.mark2@mayo.edu).

Author Contributions: All authors had full access to all of the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis. *Study concept and design:* Hylwa, Bury, Davis, Pittelkow, and Bostwick. *Acquisition of data:* Hylwa, Bury, Davis, and Pittelkow. *Analysis and interpretation of data:* Hylwa, Bury, Davis, Pittelkow, and Bostwick. *Drafting of the manuscript:* Hylwa, Bury, Davis, Pittelkow, and Bostwick. *Critical revision of the manuscript for important intellectual content:* Hylwa, Bury, Davis, Pittelkow, and Bostwick. *Statistical analysis:* Hylwa, Bury, and Davis. *Obtained funding:* Davis. *Administrative, techni-*

cal, and material support: Bury, Davis, and Pittelkow. Study supervision: Davis, Pittelkow, and Bostwick.

Financial Disclosure: None reported.

Role of the Sponsors: The sponsors had no role in the design and conduct of the study; in the collection, analysis, and interpretation of data; or in the preparation, review, or approval of the manuscript.

Online-Only Material: The eTable is available at <http://www.archdermatol.com>.

REFERENCES

1. Bewley AP, Lepping P, Freudenmann RW, Taylor R. Delusional parasitosis: time to call it delusional infestation. *Br J Dermatol*. 2010;163(1):1-2.
2. Paholpak S. Delusion of parasitosis: a report of ten cases at Srinagarind Hospital. *J Med Assoc Thai*. 1990;73(2):111-114.
3. Fellner MJ, Majeed MH. Tales of bugs, delusions of parasitosis, and what to do. *Clin Dermatol*. 2009;27(1):135-138.
4. May WW, Terpenning MS. Delusional parasitosis in geriatric patients. *Psychosomatics*. 1991;32(1):88-94.
5. Geddes ER, Rashid RM. Delusional tinea: a novel subtype of delusional parasitosis. *Dermatol Online J*. 2008;14(12):16.
6. Trabert W. *Delusional Parasitosis: Studies on Frequency, Classification and Prognosis* [dissertation]. Homburg/Saar, Germany: Universtat des Saarlandes; 1993.
7. Flann S, Sholtbolt J, Kessel B, et al. Three cases of delusional parasitosis caused by dopamine agonists. *Clin Exp Dermatol*. 2010;35(7):740-742.
8. Murase JE, Wu JJ, Koo J. Morgellons disease: a rapport-enhancing term for delusions of parasitosis. *J Am Acad Dermatol*. 2006;55(5):913-914.
9. Slaughter JR, Zanol K, Rezvani H, Flax J. Psychogenic parasitosis: a case series and literature review. *Psychosomatics*. 1998;39(6):491-500.
10. Lee WR. Matchbox sign. *Lancet*. 1983;2(8347):457-458.
11. Lynch PJ. Delusions of parasitosis. *Semin Dermatol*. 1993;12(1):39-45.
12. Freudenmann RW, Lepping P. Delusional infestation. *Clin Microbiol Rev*. 2009;22(4):690-732.
13. Bury JE, Bostwick JM. Iatrogenic delusional parasitosis: a case of physician-patient folie a deux. *Gen Hosp Psychiatry*. 2010;32(2):210-212.
14. Bellanger AP, Crouzet J, Boussard M, et al. Ectoparasitosis or Ekbohm syndrome? a case report. *Can Fam Physician*. 2009;55(11):1089-1092.
15. Bennassar A, Guilabert A, Alsina M, Pintor L, Mascaró JM Jr. Treatment of delusional parasitosis with aripiprazole. *Arch Dermatol*. 2009;145(4):500-501.
16. Suganthan JS, Rajkumar AP, Jagannath C, Pulimood SA, Jacob KS. Delusional parasitosis over dermatological morbidity: diagnostic and therapeutic challenges. *Trop Doct*. 2009;39(1):49-50.
17. Accordino RE, Engler D, Ginsburg IH, Koo J. Morgellons disease? *Dermatol Ther*. 2008;21(1):8-12.
18. Brewer JD, Meves A, Bostwick JM, Hamacher KL, Pittelkow MR. Cocaine abuse: dermatologic manifestations and therapeutic approaches. *J Am Acad Dermatol*. 2008;59(3):483-487.
19. Simonetti V, Strippoli D, Pinciara B, Spreafico A, Motolese A. Ekbohm syndrome: a disease between dermatology and psychiatry. *G Ital Dermatol Venereol*. 2008;143(6):415-419.
20. Amato Neto V, Amato JG, Amato VS, Ferreira CS. Ekbohm syndrome (delusory parasitosis): ponderations on two cases. *Rev Inst Med Trop Sao Paulo*. 2007;49(6):395-396.
21. Donabedian H. Delusions of parasitosis. *Clin Infect Dis*. 2007;45(11):e131-e134. doi:10.1086/523004.
22. Freudenmann RW, Schönfeldt-Lecuona C, Lepping P. Primary delusional parasitosis treated with olanzapine. *Int Psychogeriatr*. 2007;19(6):1161-1168.
23. Guarneri F, Guarneri C, Mento G, Ioli A. Pseudo-delusory syndrome caused by *Limothrips cerealium*. *Int J Dermatol*. 2006;45(3):197-199.
24. Meehan WJ, Badreshia S, Mackley CL. Successful treatment of delusions of parasitosis with olanzapine. *Arch Dermatol*. 2006;142(3):352-355.
25. Waddell AG, Burke WA. Morgellons disease? *J Am Acad Dermatol*. 2006;55(5):914-915.
26. Elena M, Barreras R, Mantecón Fernández B, et al. Delusional parasitosis: apropos of a case [in Spanish]. *Rev Cubana Med Trop*. 2005;57(3):233-236.
27. Krauseneck T, Soyka M. Delusional parasitosis associated with pemoline. *Psychopathology*. 2005;38(2):103-104.
28. Aw DC, Thong JY, Chan HL. Delusional parasitosis: case series of 8 patients and review of the literature. *Ann Acad Med Singapore*. 2004;33(1):89-94.
29. Kim C, Kim J, Lee M, Kang M. Delusional parasitosis as "folie a deux." *J Korean Med Sci*. 2003;18(3):462-465.
30. Le L, Gonski PN. Delusional parasitosis mimicking cutaneous infestation in elderly patients. *Med J Aust*. 2003;179(4):209-210.
31. Takahashi T, Ozawa H, Inuzuka S, Harada Y, Hanihara T, Amano N. Sulpiride for treatment of delusion of parasitosis. *Psychiatry Clin Neurosci*. 2003;57(5):552-553.
32. Wenning MT, Davy LE, Catalano G, Catalano MC. Atypical antipsychotics in the treatment of delusional parasitosis. *Ann Clin Psychiatry*. 2003;15(3-4):233-239.
33. Bhatia MS, Chandra R, Kamra A. Delusional parasitosis in leprosy. *Indian J Lepr*. 2002;74(2):159-160.
34. Ford EB, Calfee DP, Pearson RD. Delusions of intestinal parasitosis. *South Med J*. 2001;94(5):545-547.
35. Nel M, Schoeman JP, Lobetti RG. Delusions of parasitosis in clients presenting pets for veterinary care. *J S Afr Vet Assoc*. 2001;72(3):167-169.
36. Schwartz E, Witztum E, Mumcuoglu KY. Travel as a trigger for shared delusional parasitosis. *J Travel Med*. 2001;8(1):26-28.
37. Bhatia MS, Jagawat T, Choudhary S. Delusional parasitosis: a clinical profile. *Int J Psychiatry Med*. 2000;30(1):83-91.
38. Chigusa Y, Shinonaga S, Koyama Y, Terano A, Kirinoki M, Matsuda H. Suspected intestinal myiasis due to *Dryomyza formosa* in a Japanese schizophrenic patient with symptoms of delusional parasitosis. *Med Vet Entomol*. 2000;14(4):453-457.
39. Levine N. Raised scaly and crusted papules. *Geriatrics*. 2000;55(1):16.
40. Stephens MB. Delusions of parasitosis. *Am Fam Physician*. 1999;60(9):2507-2508.
41. Sherman MD, Holland GN, Holsclaw DS, Weisz JM, Omar OH, Sherman RA. Delusions of ocular parasitosis. *Am J Ophthalmol*. 1998;125(6):852-856.
42. Adunsky A. Early post-stroke parasitic delusions. *Age Ageing*. 1997;26(3):238-239.
43. Winsten M. Delusional parasitosis: a practical guide for the family practitioner in evaluation and treatment strategies. *J Am Osteopath Assoc*. 1997;97(2):95-99.
44. Koo J, Gambla C, Fried R. Pseudopsychodermatologic disease. *Dermatol Clin*. 1996;14(3):525-530.
45. Goddard J. Analysis of 11 cases of delusions of parasitosis reported to the Mississippi Department of Health. *South Med J*. 1995;88(8):837-839.
46. Freyne A, Wrigley M. Delusional infestation in an elderly population. *Ir Med J*. 1994;87(3):86-88.
47. Monk BE, Rao YJ. Delusions of parasitosis with fatal outcome. *Clin Exp Dermatol*. 1994;19(4):341-342.
48. Srinivasan TN, Suresh TR, Jayaram V, Fernandez MP. Nature and treatment of delusional parasitosis: a different experience in India. *Int J Dermatol*. 1994;33(12):851-855.
49. Bourgeois ML, Duhamel P, Verdoux H. Delusional parasitosis: folie à deux and attempted murder of a family doctor. *Br J Psychiatry*. 1992;161:709-711.
50. Aizenberg D, Schwartz B, Zemishlany Z. Delusional parasitosis associated with phenelzine. *Br J Psychiatry*. 1991;159:716-717.
51. Gieler U, Knoll M. Delusional parasitosis as "folie à trois." *Dermatologica*. 1990;181(2):122-125.
52. Wurtz R. Psychiatric diseases presenting as infectious diseases. *Clin Infect Dis*. 1998;26(4):924-932.