Microbiology Spectrum
American Society for Microbiology Press

Cutaneous Tuberculosis

MICHAEL K. HILL[1] and CHARLES V. SANDERS[2]

[1]Saint Tammany Parish Hospital, Covington, LA 70433;
[2]Department of Medicine, Louisiana State University School of Medicine, New Orleans, LA 70112

ABSTRACT Cutaneous tuberculosis (TB) may present in various clinical manifestations. Skin involvement may occur as a result of exogenous inoculation, contiguous spread from a nearby focus of infection, or by hematogenous spread from a distant focus. Because the clinical presentation of cutaneous TB can vary widely, it is important to have a high index of suspicion in appropriate clinical settings. In this chapter, the various clinical manifestations of clinical TB are classified by source of infection (exogenous, endogenous, and hematogenous spread). These are linked to the clinical appearance and histology of the skin lesions. Hopefully, this will resolve the confusion created by the myriad of terms previously used in the medical literature. Once a diagnosis of cutaneous TB is entertained, a biopsy for both culture and histopathology should be submitted. In some cases histopathology may show nonspecific inflammation without classic granuloma formation. In these cases, monoclonal antibodies and polymerase chain reaction (PCR) testing may be useful. In fact, in recent years, PCR amplification has proven to be invaluable in assisting identification of *M. tuberculosis* from skin biopsies in patients with negative TB cultures. In most instances, treatment of cutaneous TB requires combination chemotherapy. This is especially important in patients with extra cutaneous disease, multiple skin lesions, and those with profound immunosuppression. Surgery also may play both a diagnostic and therapeutic role.

Cutaneous tuberculosis (TB) is not a well-defined entity but comprises a wide spectrum of clinical manifestations. In the past, much of the confusion regarding cutaneous TB has resulted from misleading, redundant nomenclature and cumbersome, non-clinically oriented classifications of cutaneous disease. These classifications have been based on various criteria, including chronic versus labile disease, localizing versus hematogenous disease, histologic forms of disease, immunologic status of the patient, primary disease versus reinfection, and listing of the various types of cutaneous mycobacteriosis (1–3). A more clinically relevant classification has been developed that uses three criteria: pathogenesis, clinical presentation, and histologic evaluation (Table 1).

Skin involvement may occur as a result of exogenous inoculation (in non-previously sensitized hosts, regional adenopathy occurs) by contagious spread from a focus underlying the skin, particularly from osteomyelitis, epididymitis, or lymphadenitis, and by hematogenous spread from a distant focus or as a part of a generalized hematogenous dissemination (4, 5). Although it is rare in the United States and accounts for less than 1% of cases in European dermatologic clinics, there has been an increase in the incidence of cutaneous TB (5, 6). Contrary to earlier claims that cutaneous TB is uncommon in the tropics, reports from India, Southeast Asia, and Africa prove otherwise (7).

INOCULATION CUTANEOUS TB FROM AN EXOGENOUS SOURCE

Primary inoculation TB results from the entry of mycobacteria into the skin or, less frequently, the mucosa of a person who has not previously been infected or who has no natural or artificial immunity to *Mycobacterium tuberculosis*. Because the acid-fast bacilli (AFB) cannot penetrate the normal intact skin barrier, some form of injury is required to initiate the infection. The entry point for AFB is usually through minor skin abrasions, hangnail wounds, impetigo, or furuncles.

Received: 27 September 2016, **Accepted:** 7 December 2016, **Published:** 24 February 2017.

Editor: David Schlossberg, Philadelphia Health Department, Philadelphia, PA

Citation: Hill MK, Sanders CV. 2017. Cutaneous tuberculosis. *Microbiol Spectrum* 5(1):TNMI7-0010-2016. doi:10.1128/microbiolspec.TNMI7-0010-2016.

Correspondence: Michael K. Hill, eclee@stph.org

TABLE 1 Classification of cutaneous TB and synonymous terms used previously[a]

Classification of cutaneous TB	Clinical appearance	Histology	Associated finding	Terms previously used in literature
Cutaneous TB from exogenous source				
Primary inoculation	Ulcer, nodule, local disease, lymphatic extension	Chronic inflammation, granulomatous inflammation	History of trauma	Primary inoculation TB chancre TB primary complex
Post-primary inoculation	Hyperkeratotic papule, "wart"	Hyperkeratosis	History of trauma	TB verrucosa cutis Warty TB Verruca necrogenica Prosector's wart TB cutis verrucosa
Cutaneous TB from endogenous source				
Contiguous spread	Sinus tract, abscess	Granulomatous inflammation, sinus tract	Underlying infected source	Scrofuloderma TB colliquativa cutis
Autoinoculation	Ulcer at body orifice	Ulceration, granulomatous inflammation	Widespread TB	Orofacial TB TB cutis orificialis TB ulcerosa cutis et mucosae
Cutaneous TB from hematogenous spread				
Lupus vulgaris	Multiple nodules and plaques on face, neck	Granulomatous inflammation	May develop carcinoma	Lupus vulgaris TB luposa cutis
Acute hematogenous dissemination	Multiple papules and pustules	Nonspecific inflammation	Acute presentation	Acute miliary TB of the skin TB cutis miliaris disseminate TB cutis acuta generalisata
Nodules or abscesses	Multiple soft tissue abscesses	Granulomatous inflammation	May arise at site of trauma	TB gumma Metastatic tuberculous abscess

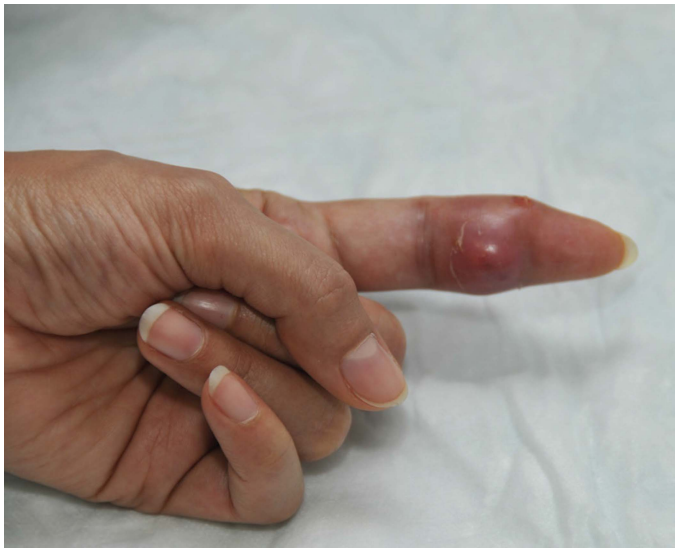
[a]Adapted from the work of Beyt et al. (2).

Although inoculation can occur in a variety of ways, most reports have involved persons working in medically related professions (Fig. 1). Laennec described his own "prosector's wart" in 1826. TB lesions have followed mouth-to-mouth resuscitation, inoculation, inoculation of laboratory guinea pigs, injection with poorly sterilized needles, ear piercing, intramuscular injections given by a nurse with active TB, tattooing, insect bites, sexual intercourse leading to venereal inoculation TB, and venipuncture in an infant (8–23). Historically, ritualistic circumcision performed by a practitioner with active pulmonary TB has resulted in miliary disease in the infant (14).

Mucocutaneous involvement may account for one-third of the total primary cutaneous TB cases and includes infection of the conjunctiva or of the oral cavity after tooth extraction or after drinking nonpasteurized milk infected with *Mycobacterium bovis* (4, 5, 7, 24).

The pathogenesis of cutaneous TB from an exogenous source is similar to that of other primary diseases. Over 2 to 4 weeks, as the organism multiplies in the skin, a tuberculous chancre slowly develops, initially appearing as a nodule that evolves into an indolent, firm, nontender, sharply delineated ulcer. It also may develop into impetiginous or ichthyotic forms. Lymphatic extension occurs, and lymphadenopathy occurs 3 to 8 weeks after skin inoculation. The purified protein derivative (PPD) skin test result becomes positive, and enlarged lymph nodes may become fluctuant and drain spontaneously. The complex of the tuberculous chancre and regional adenopathy is the cutaneous analog of the primary tubercular infection of the lung, the Gohn complex. Within 2 to 3 years, calcification can be found in draining nodes.

FIGURE 1 Cutaneous TB from needlestick injury in a lab technologist. Reprinted with permission from reference 83.



The early histologic picture is an acute neutrophilic reaction with embedded areas of necrosis associated with numerous AFB. Three to six weeks later, the infiltrate becomes granulomatous and caseation necrosis becomes evident. In some instances, the dermal infiltrate is nonspecific. AFB may or may not be present (5).

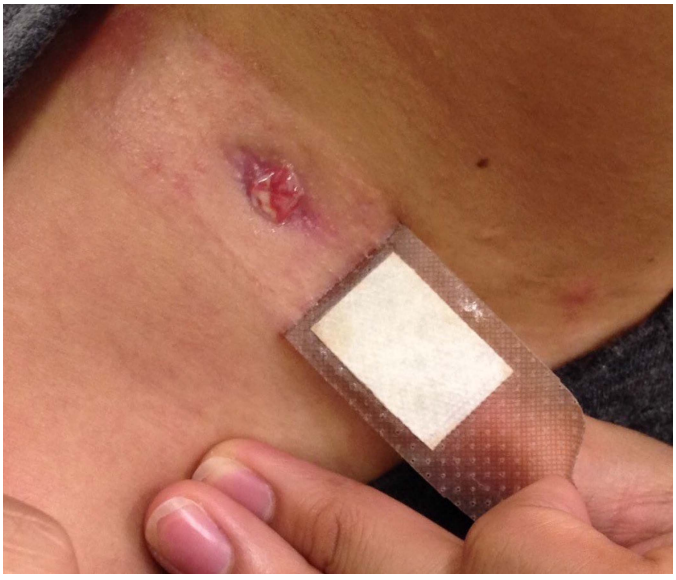
In patients with preexisting immunity to TB, postprimary cutaneous inoculation usually results, heralded by development of a hyperkeratotic papule—the prosector's wart—which eventually becomes verrucous. The lesion progresses centrifugally in an annular or a serpiginous fashion. Spontaneous resolution is common in the center of the lesion. Unlike in the primary lesion, in the postprimary lesion no associated adenopathy occurs. The postprimary lesion also rarely ulcerates, and spontaneous involution may occur over months to years (5, 18).

CUTANEOUS TB FROM AN ENDOGENOUS SOURCE

Cutaneous infection with TB may result from contiguous involvement of the skin overlying a subcutaneous focus (most commonly tuberculous lymphadenitis) or TB of the bones and joints, or it may be secondary to TB epididymitis (Fig. 2). In the past, the term scrofuloderma was used to describe this condition. Cervical lymph nodes are affected most often, and children are afflicted more frequently than adults (25).

The initial lesion is typically a firm subcutaneous swelling or nodule that, although initially mobile, soon firmly attaches to the overlying skin. It then suppurates, and eventually an indolent chronic draining sinus tract or cutaneous abscess develops. Multiple ulcers may form; these are arranged linearly. Watery, purulent, or caseous discharge may occur from the sinus. Spontaneous healing, if it does occur, may take years to complete.

FIGURE 2 Draining ulcer overlying tuberculous lymphadenitis —"scrofuloderma." Photo courtesy of David Schlossberg.



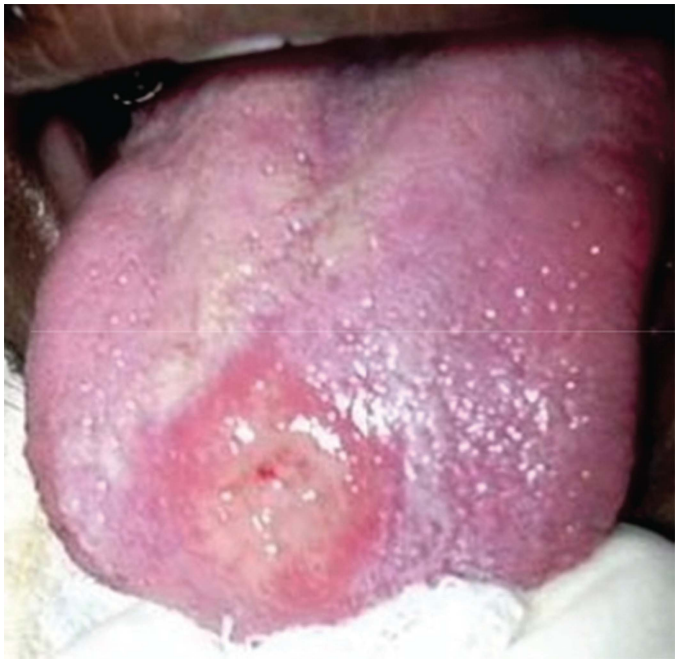


FIGURE 3 Tuberculous ulcer of tongue in patient with pulmonary tuberculosis. Reprinted with permission from reference 84.

Histopathologically, caseation necrosis and granuloma formation occur; AFB are demonstrated on special stains. As the lesion ages, granuloma formation may be replaced by a nonspecific chronic inflammatory infiltrate and AFB may become scarce (5, 18). The PPD test result is usually positive, and concurrent pulmonary TB occurs frequently.

Occasionally, cutaneous TB results from the autoinoculation of the mucous membrane and adjoining of the orifices that occurs when viable organisms are either expectorated or passed in patients without significant immunity (26, 27) (Fig. 3). The organisms invade tissue that is normally resistant to infection. In the past, the term orofacial TB was used to describe this condition. The typical patient with this condition is older, lacks PPD reactivity, and has far-advanced pulmonary, intestinal, or genitourinary TB (5, 28). AFB shed from these primary foci are inoculated into the mucocutaneous areas of the orifices at previously traumatized sites. Lesions occur in the oral cavity or perineal/perirectal skin (7, 10, 29); they are ulcerative and painful

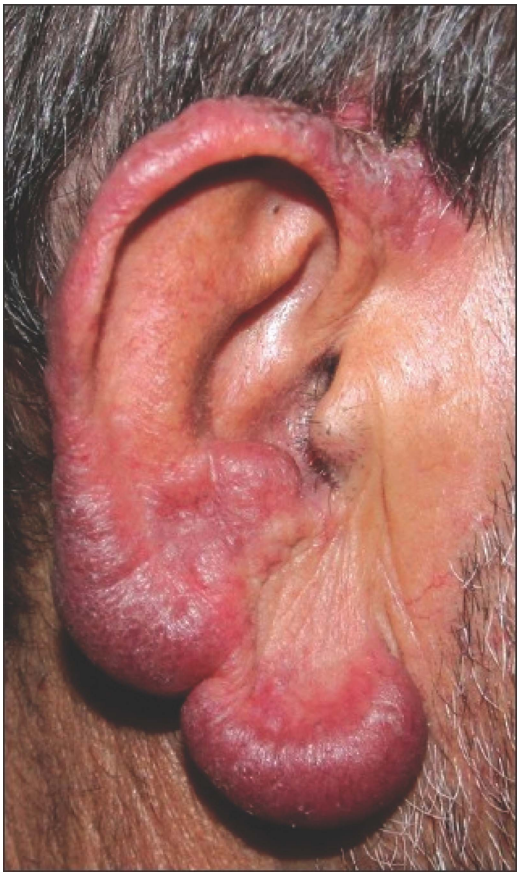
and do not heal spontaneously. Nonspecific ulceration and lymphedema occur superficially (7, 18). In most cases, granuloma formation and caseation necrosis are found deep in the dermis. AFB are usually present.

CUTANEOUS TB FROM A HEMATOGENOUS SOURCE

Lupus vulgaris is a particular type of chronic cutaneous TB in a previously sensitized person with a high degree of TB sensitivity. Hematogenous or lymphatic seeding accounts for the majority of cases. Occasionally, lupus vulgaris appears over a primary inoculation site, in a scar of scrofuloderma, or after recurrent bacillus Calmette-Guérin vaccinations (30–34). These lesions are usually solitary plaques or nodules with some ulceration and scarring; they typically appear as "apple jelly" nodules on diascopy and are most commonly located on the face or neck (Fig. 4).

Several diverse presentations of lupus vulgaris have been reported and include psoriasiform lesions, nasal ulcerations, and eventual destruction of the cartilaginous part of the nasal septum, as well as widespread systemic dissemination (35–38). Because of the broad range of clinical presentations, many cases are misdiagnosed for years (27, 39–41). The tuberculin skin test result is frequently positive. Malignancy develops in up to 8% of patients with long-standing lupus vulgaris. Squamous cell carcinoma and sarcoma occur occasionally (42–46). An instance of Hodgkin's disease complicating lupus vulgaris also has been described (47). The histopathological picture of lupus vulgaris is diverse and not always diagnostic. When caseation necrosis is present, it is minimal, and AFB are difficult to demonstrate (48).

FIGURE 4 Lupus vulgaris of the ear. Reprinted with permission from reference 85.



An uncommon fulminant form of cutaneous TB, previously known as TB cutis miliaris disseminate, occurs in infants or children after acute hematogenous dissemination of *M. tuberculosis* and is seen increasingly in individuals with impaired cellular immunity, such as patients with advanced HIV disease (4, 49, 50). The initial focus of infection is either pulmonary or meningeal, and it may be preceded by an exanthematous disease such as measles (51). Lesions occur most commonly on the trunk, thighs, buttocks, and genitalia, beginning as papules capped by minute vesicles that eventually rupture and crust (5, 49, 52).

Histologic examination of these lesions reveals a nonspecific inflammatory cellular infiltrate with focal areas of necrotizing vasculitis, and vascular thrombi containing numerous bacilli have been reported (5, 26, 50). The disease is usually fatal, although a few cases of improvement after antituberculosis chemotherapy have occurred (5, 53).

Cutaneous hematogenous dissemination of *M. tuberculosis* may present subacutely as soft tissue abscesses or nodules (53–57). Occasionally, the abscess develops at the site of previous trauma, suggesting localization of blood-borne organisms in the injured tissue. Multiple cold abscesses and chronic recurrent perirectal abscesses have been reported to occur in patients with AIDS, and multiple skin nodules from disseminated TB have also occurred in these patients (58–61). The multiple skin nodules can be nondescript in the patient with AIDS, necessitating a high degree of suspicion on the clinician's part, especially in patients with CD4 counts under 200/ml. In some cases these isolates develop multidrug resistance and become rapidly fatal (62–64).

TUBERCULOUS MASTITIS

TB of the breast—tuberculous mastitis—is extremely rare, difficult to recognize, and frequently misdiagnosed

as breast cancer. It occurs most often in women 20 to 50 years of age who present with a hard, nontender nodule or mass in the breast along with axillary adenopathy (38, 65–68). The inflammatory lesion may suppurate and drain. Breast involvement is a result of retrograde lymphatic extensions from underlying mediastinal, parasternal, axillary, or cervical lymph nodes. Histologically, granulomatous inflammation and caseation may be found.

TUBERCULIDS

Tuberculids are a group of cutaneous conditions occurring in the presence of TB but containing no stainable or culturable AFB; based on histopathology, then, they were previously regarded as an allergic reaction to the infection. These conditions have included erythema induratum, papulonecrotic tuberculids, and lichen scrofulosorum. Many of these lesions are now thought to be secondary to nontuberculous processes. A possible exception to this is erythema nodosum, which has been attributed to primary TB.

DIAGNOSIS

Because of the varied clinical spectrum and rarity of cutaneous TB, a high index of suspicion is needed to identify skin lesions that may be tubercular in origin and will therefore require biopsy for histopathology purposes as well as AFB stain and culture. In some cases, histopathology shows nonspecific inflammation without granuloma formation. Fluorescent staining with auramine or rhodamine may be useful (69, 70). Enzyme-linked immunosorbent assay for antibodies to PPD and to *M. tuberculosis* antigen 5 also may be helpful (71–74). Monoclonal antibody assays and the PCR technique have become increasingly useful clinically (75, 76). Recently, for example, PCR amplification has proven to be a rapid and accurate means of identifying *M. tuberculosis* from patients with cutaneous TB (1, 77–80).

THERAPY

The mainstay of therapy is chemotherapy. Treatment of lupus vulgaris with isoniazid alone has resulted in high cure rates (81, 82). Combination chemotherapy is recommended for patients with extracutaneous disease and multiple skin lesions and for those with profound immunosuppression. The reader is referred elsewhere for a detailed discussion. Surgery, which can include excisional biopsy and debridement, also may play a minor adjuvant role in treatment. With the exception of TB cutis miliaris disseminate (discussed above), most forms of cutaneous TB respond to chemotherapy and carry a good prognosis.

A paradoxical skin reaction sometimes occurs in patients undergoing antituberculosis therapy, particularly in anergic patients treated for miliary TB: weeks or months into therapy, fluctuant swellings appear that on aspiration yield pus. Smear and culture for *M. tuberculosis* are often positive, and the isolate usually retains its susceptibility to the patient's treatment regimen. This paradoxical response is thought to represent an immunologic phenomenon—not resistance—and typically responds to continued chemotherapy.

REFERENCES

1. Baselga E, Barnadas MA, Margall N, de Moragas JM. 1996. Detection of *M. tuberculosis* complex DNA in a lesion resembling sarcoidosis. *Clin Exp Dermatol* **21:**235–238.

2. Beyt BE, Jr, Ortbals DW, Santa Cruz DJ, Kobayashi GS, Eisen AZ, Medoff G. 1981. Cutaneous mycobacteriosis: analysis of 34 cases with a new classification of the disease. *Medicine* (Baltimore) **60:**95–109.

3. Lenzini L, Rottoli P, Rottoli L. 1977. The spectrum of human tuberculosis. *Clin Exp Immunol* **27:**230–237.

4. Dinning WJ, Marston S. 1985. Cutaneous and ocular tuberculosis: a review. *J R Soc Med* **78:**576–581.

5. Sehgal VN, Wagh SA. 1990. Cutaneous tuberculosis. Current concepts. *Int J Dermatol* **29:**237–252.

6. Sehgal VN, Jani MK, Srivastavia G. 1989. Changing patterns of cutaneous tuberculosis. *Int J Dermatol* **28:**231–236.

7. Shengold MA, Sheingold H, Heights J. 1951. Oral tuberculosis. *Oral Surg Oral Med Oral Pathol* **4:**239–250.

8. Angus BJ, Yates M, Conlon C, Byren I. 2001. Cutaneous tuberculosis of the penis and sexual transmission of tuberculosis confirmed by molecular typing. *Clin Infect Dis* **33:**E132–E134.

9. Bjornstad R. 1947. Tubercular primary infection of genitalia: two case reports of venereal genital tuberculosis. *Acta Derm Venereol* **27:** 106.

10. Engelman WR, Putney FJ. 1972. Tuberculosis of the tongue. *Trans Am Acad Ophthalmol Otolaryngol* **76:**1384–1386.

11. Goette DK, Jacobson KW, Doty DR. 1978. Primary cutaneous inoculation tuberculosis of the skin. *Arch Dermatol* **114:**567–569.

12. Heilmaa KM, Muschenheim C. 1978. Primary cutaneous tuberculosis of the skin. *Arch Dermatol* **273:**1035–1036.

13. Heycock JB, Noble TC. 1961. Four cases of syringe-transmitted tuberculosis. *Tubercle* **42:**25–27.

14. Hole LE. 1913. Tuberculosis acquired through ritual circumcision. *JAMA* **61:**99–102.

15. Hoyt EM. 1981. Primary inoculation tuberculosis. Report of a case. *JAMA* **245:**1556–1557.

16. Kramer F, Sasse SA, Simms JC, Leedom JM. 1993. Primary cutaneous tuberculosis after a needlestick injury from a patient with AIDS and undiagnosed tuberculosis. *Ann Intern Med* **119:**594–595.

17. Minkowitz S, Brandt LJ, Rapp Y, Radlauer CB. 1969. "Prosector's wart" (cutaneous tuberculosis) in a medical student. *Am J Clin Pathol* **51:**260–263.

18. Montgomery H. 1937. Histopathology of various types of cutaneous tuberculosis. *Arch Dermatol Syph* **35:**698–715.

19. O'Donnell TF, Jr, Jurgenson PF, Weyerich NF. 1971. An occupational hazard—tuberculous paronychia. Report of a case. *Arch Surg* **103:**757–758.

20. Pereira CA, Webber B, Orson JM. 1976. Primary tuberculous complex of the skin. *JAMA* **235:**942.

21. Rytel MW, Davis ES, Prebil KJ. 1970. Primary cutaneous inoculation tuberculosis. Report of two cases. *Am Rev Respir Dis* **102:**264–267.

22. Sahn SA, Pierson DJ. 1974. Primary cutaneous inoculation drug-resistant tuberculosis. *Am J Med* **57:**676–678.

23. Strand S. 1946. Tubercular primary lesion on penis—cancer, penis venereal tuberculosis. *Acta Derm Venereol* **26:**461.

24. Weaver RA. 1976. Tuberculosis of the tongue. *JAMA* **235:**2418.

25. Michelson HE. 1924. Scrofuloderma gummosa (tuberculosis colliquativa). *Arch Dermatol* **10:**565–578.

26. Lipper S, Watkins DL, Kahn LB, Stenn K. 1980. Nongranulomatous septic vasculitis due to miliary tuberculosis. A pitfall in diagnosis for the pathologist. *Am J Dermatopathol* **2:**71–74.

27. Schmitt CL, Pomeranz JR, Pomeranz JR. 1976. Lupus vulgaris: recovery of living tubercle bacilli 35 years after onset. *Cutis* **18:**221–223.

28. McAndrew PG, Adekeye EO, Ajdukiewicz AB. 1976. Miliary tuberculosis presenting with multifocal oral lesions. *BMJ* **1:**1320.

29. Nepomuceno OR, O'Grady JF, Eisenberg SW, Bacon HE. 1971. Tuberculosis of the anal canal: report of a case. *Dis Colon Rectum* **14:**313–316.

30. Barbagallo J, Tager P, Ingleton R, Hirsch RJ, Weinberg JM. 2002. Cutaneous tuberculosis: diagnosis and treatment. *Am J Clin Dermatol* **3:**319–328.

31. Caplan SE, Kauffman CL. 1996. Primary inoculation tuberculosis after immunotherapy for malignant melanoma with BCG vaccine. *J Am Acad Dermatol* **35:**783–785.

32. Izumi AK, Matsunaga J. 1982. BCG vaccine-induced lupus vulgaris. *Arch Dermatol* **118:**171–172.

33. Lee SM, Hann SK, Chun SI, Lee SH, Park YK. 1994. An unusual form of skin tuberculosis following B.C.G. vaccination. *J Dermatol* **21:**106–110.

34. Maguire A. 1968. Lupus marinus: the discovery, diagnosis and treatment of seventeen cases of lupus marinus. *Br J Dermatol* **80:**213–219.

35. Bateman DE, Makepeace W, Lesna M. 1980. Miliary tuberculosis in association with chronic cutaneous tuberculosis. *Br J Dermatol* **103:**557–560.

36. Fine RM, Meltzer HD. 1970. Psoriasiform lupus vulgaris: a case report. *Int J Dermatol* **9:**273–277.

37. Fisher JR. 1977. Miliary tuberculosis with unusual cutaneous manifestations. *JAMA* **238:**241–242.

38. Warin AP, Jones EW. 1977. Cutaneous tuberculosis of the nose with unusual clinical and histological features leading to a delay in the diagnosis. *Clin Exp Dermatol* **2:**235–242.

39. Duncan WC. 1968. Cutaneous mycobacterial infections. *Tex Med* **64:**66–70.

40. Martin AR, Mark EJ. 1972. Case 43-1972—granulomatous disease in a man from Honduras. *N Engl J Med* **287:**872–878.

41. Stevens CS, Vander Ploeg DE. 1981. Lupus vulgaris: a case that escaped diagnosis for twenty-eight years. *Cutis* **27:**510–511, 514–515, 525.

42. Förström L. 1969. Carcinomatous changes in lupus vulgaris. *Ann Clin Res* **1:**213–219.

43. Harrison PV, Marks JM. 1980. Lupus vulgaris and cutaneous lymphoma. *Clin Exp Dermatol* **5:**73–77.

44. Ljubenovic MS, Ljubenovic DB, Binic II, Jankovic AS, Jancic SA. 2011. Cutaneous tuberculosis and squamous-cell carcinoma. *An Bras Dermatol* **86:**541–544.

45. Nyfors A. 1968. Lupus vulgaris, isoniazid, and cancer. The frequency of cancer deaths in 245 isoniazid-treated lupus vulgaris patients with an average observation period of 12 years. *Scand J Respir Dis* **49:**264–269.

46. Zawirska A, Adamski Z, Stawicka E, Schwartz RA. 2009. Cutaneous squamous cell carcinoma developing in lupus vulgaris exfoliativus persistent for 40 years. *Int J Dermatol* **48:**125–127.

47. Schein PS, Vickers HR. 1972. Lupus vulgaris and Hodgkin's disease. *Arch Dermatol* **105:**244–246.

48. Sehgal VN, Srivastava G, Khurana VK, Sharma VK, Bhalla P, Beohar PC. 1987. An appraisal of epidemiologic, clinical, bacteriologic, histopathologic, and immunologic parameters in cutaneous tuberculosis. *Int J Dermatol* **26:**521–526.

49. Platou RV, Lennox RH. 1956. Tuberculous cutaneous complexes in children. *Am Rev Tuberc* **74:**160–169; discussion, 169–172.

50. Yamauchi T, Klein JD, Farrell WF. 1973. Tuberculosis of the skin. *Am J Dis Child* **125:**855–856.

51. Sundt A. 1925. A case of lupus dissematus (post exanthematic miliary tuberculosis cutis). *Br J Dermatol* **37:**316–324.

52. McCray MK, Esterly NB. 1981. Cutaneous eruptions in congenital tuberculosis. *Arch Dermatol* **117:**460–464.

53. Kennedy C, Knowles GK. 1975. Miliary tuberculosis presenting with skin lesions. *BMJ* **3:**356.

54. Munt PW. 1972. Miliary tuberculosis in the chemotherapy era: with a clinical review in 69 American adults. *Medicine* (Baltimore) **51:**139–155.

55. Reitbrock RC, Dahlmans RPM, Smedts F, Frantzen PJ, Koopman RJ, VanderMeer JW. 1991. Tuberculosis cutis miliaris dissemination as a manifestation of miliary tuberculosis. A literature review and report of a case of recurrent skin lesions. *Rev Infect Dis* **12:**265–269.

56. Shaw NM, Basu AK. 1970. Unusual cold abscesses. *Br J Surg* **57:**418–422.

57. Ward AS. 1971. Superficial abscess formation: an unusual presenting feature of tuberculosis. *Br J Surg* **58:**540–543.

58. Daikos GL, Uttamchandani RB, Tuda C, Fischl MA, Miller N, Cleary T, Saldana MJ. 1998. Disseminated miliary tuberculosis of the skin in patients with AIDS: report of four cases. *Clin Infect Dis* **27:**205–208.

59. Handwerger S, Mildvan D, Senie R, McKinley FW. 1987. Tuberculosis and the acquired immunodeficiency syndrome at a New York City hospital: 1978–1985. *Chest* **91:**176–180.

60. Sunderam G, Mongura BT, Lombardo JM, Reichman LB. 1987. Failure of four-drug short course tuberculosis chemotherapy in a compliant patient with human immunodeficiency syndrome (AIDS). *Am Rev Respir Dis* **136:**1475–1478.

61. Sunderam G, McDonald RJ, Maniatis T, Oleske J, Kapila R, Reichman LB. 1986. Tuberculosis as a manifestation of the acquired immunodeficiency syndrome (AIDS). *JAMA* **256:**362–366.

62. Antinori S, Galimberti L, Tadini GL, Ridolfo AL, Parravicini C, Esposito R, Moroni M. 1995. Tuberculosis cutis miliaris disseminata due to multidrug-resistant *Mycobacterium tuberculosis* in AIDS patients. *Eur J Clin Microbiol Infect Dis* **14:**911–914.

63. Corbett EL, Crossley I, De Cock KM, Miller RF. 1995. Disseminated cutaneous *Mycobacterium tuberculosis* infection in a patient with AIDS. *Genitourin Med* **71:**308–310.

64. Libraty DH, Byrd TF. 1996. Cutaneous miliary tuberculosis in the AIDS era: case report and review. *Clin Infect Dis* **23:**706–710.

65. Cohen C. 1977. Tuberculous mastitis. A review of 34 cases. *S Afr Med J* **52:**12–14.

66. De Sousa R, Patil R. 2011. Breast tuberculosis or granulomatous mastitis: a diagnostic dilemma. *Ann Trop Med Public Health* **4:**122–125.

67. Mukerjee P, Cohen RV, Niden AH. 1971. Tuberculosis of the breast. *Am Rev Respir Dis* **104:**661–667.

68. Schaefer G. 1955. Tuberculosis of the breast; a review with the additional presentation of ten cases. *Am Rev Tuberc* **72:**810–824.

69. Koch ML, Cote RA. 1965. Comparison of fluorescence microscopy with Ziehl-Neelsen stain for demonstration of acid-fast bacilli in smear preparations and tissue sections. *Am Rev Respir Dis* **91:**283–284.

70. Wilner G, Nassar SA, Siket A, Azar HA. 1969. Fluorescent staining for mycobacteria in sarcoid and tuberculous granulomas. *Am J Clin Pathol* **51:**584–590.

71. Benjamin RG, Daniel TM. 1982. Serodiagnosis of tuberculosis using the enzyme-linked immunoabsorbent assay (ELISA) of antibody to *Mycobacterium tuberculosis* antigen 5. *Am Rev Respir Dis* **126:**1013–1016.

72. Daniel TM, Benjamin RG, Debanne SM, Ma Y, Balestrino EA. 1985. ELISA of IgG antibody to *M. tuberculosis* antigen 5 for serodiagnosis of tuberculosis. *Indian J Pediatr* **52:**349–355.

73. Lai CC, Tan CK, Lin SH, Liu WL, Liao CH, Huang YT, Hsueh PR. 2011. Diagnostic value of an enzyme-linked immunospot assay for interferon-γ in cutaneous tuberculosis. *Diagn Microbiol Infect Dis* **70:**60–64.

74. Nassau E, Parsons ER, Johnson GD. 1976. The detection of antibodies to *Mycobacterium tuberculosis* by microplate enzyme-linked immunosorbent assay (ELISA). *Tubercle* **57:**67–70.

75. Senturk N, Sahin S, Kocagoz T. 2002. Polymerase chain reaction in cutaneous tuberculosis: is it a reliable diagnostic method in paraffin-embedded tissues? *Int J Dermatol* **41:**863–866.

76. Tan SH, Tan BH, Goh CL, Tan KC, Tan MF, Ng WC, Tan WC, Tan WC. 1999. Detection of *Mycobacterium tuberculosis* DNA using polymerase chain reaction in cutaneous tuberculosis and tuberculids. *Int J Dermatol* **38:**122–127.

77. Hsiao PF, Tzen CY, Chen HC, Su HY. 2003. Polymerase chain reaction based detection of *Mycobacterium tuberculosis* in tissues showing granulomatous inflammation without demonstrable acid-fast bacilli. *Int J Dermatol* **42:**281–286.

78. Margall N, Baselga E, Coll P, Barnadas MA, de Moragas JM, Prats G. 1996. Detection of *Mycobacterium tuberculosis* complex DNA by the polymerase chain reaction for rapid diagnosis of cutaneous tuberculosis. *Br J Dermatol* **135:**231–236.

79. Pai M. 2004. The accuracy and reliability of nucleic acid amplification tests in the diagnosis of tuberculosis. *Natl Med J India* **17:**233–236.

80. Quirós E, Maroto MC, Bettinardi A, González I, Piédrola G. 1996. Diagnosis of cutaneous tuberculosis in biopsy specimens by PCR and southern blotting. *J Clin Pathol* **49:**889–891.

81. Brück C, Westbeck-Carlsson M. 1964. Treatment of lupus vulgaris with INH exclusively. *Acta Derm Venereol* **44:**223–225.

82. Förström L. 1969. Isoniazid treatment of lupus vulgaris. A long-term follow-up study. *Ann Clin Res* **1:**36–39.

83. Ghanbar MI, Bukharie HA. 2015. Another hazard to laboratory workers. *Saudi J Med Med Sci* **3:**174.

84. Kapoor S, Gandhi S, Gandhi N, Singh I. 2014. Oral manifestations of tuberculosis. *CHRISMED J Health Res* **1:**11–14.

85. Küçükünal A, Ekmekçi TR, Sakız D. 2012. "Turkey ear" as a cutaneous manifestation of tuberculosis. *Indian J Dermatol* **57:**504.

86. De Luca M. 1951. Skin tuberculosis. I. Etiology, pathogenesis, histology, classification. *Rass Int Clin Ter* **31:**335–340.

87. Fisher I, Orkin M. 1966. Primary tuberculosis of the skin. Primary complex. *JAMA* **195:**314–316.