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Review Article

Scabies: Clinical manifestations and diagnosis

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ABSTRACT

Introduction: Scabies is an infectious disease caused by an obligate parasite of human skin – *Sarcoptes scabiei* var. *hominis*. The disease affects people regardless of their age, sex or socioeconomic status. The transmission occurs mainly through direct contact with an infected person as well as personal items including clothes, bedclothes, etc.

Aim: The aim of the paper is to present a variety of clinical manifestations of scabies as well as diagnostic methods used.

Discussion: The diagnosis of scabies can often times be difficult, especially if there are concurrent diseases, with pruritus being a symptom. The skin lesions may vary in appearance, depending on the local and general immune response. The diagnosis rests on finding characteristic signs of the disease accompanied by the pruritus becoming particularly intense at night. The use of various diagnostic tools allows for confirmation of the diagnosis, with varied sensitivity and specificity, which is based on confirmation of the presence of the parasite.

Conclusions: Scabies still remains a major public health problem worldwide. Research is hindered mainly due to difficulty in obtaining the material from infested people as well as a lack of an in vitro system. To date, there is no diagnostic method for detecting scabies infection, which would give a 100% reliable result. Each of the methods mentioned above has some limitations in use. It seems that the sensitivity of those methods will vary, depending on a patient's clinical features.

1. Introduction

Scabies is a common infectious skin disease caused by the human scabies mite of *Sarcoptes scabiei* var. *hominis*, which has been known since ancient times. Aristotle was the first to use the term 'akari' with relation to this parasite. Although scabies has been widely described, it was Bonomo and Cestoni who associated the symptoms with the parasite in 1687. They described, among other observations, the parasitic nature and course of the disease, treatment, possible routes of transmission, as well as the morphological features of the parasite.[1,2]

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The disease affects people of all races and social classes. The cases of infestation among people in places where long-term care is required such as residential homes or hospitals, as well as schools, nurseries and other institutions are not infrequent either.[3,4]

Scabies is recognized as a public health problem worldwide. The majority of the cases reported occur in the Third World and developing countries, which are at the same time endemic regions.[5]

2. Aim

The aim of the paper is to present a variety of clinical manifestations of scabies as well as diagnostic methods used.

3. Discussion

3.1. *Clinical manifestations*

In people, clinical manifestations of scabies can mimic a number of other skin diseases, such as eczema, impetigo, fungal infections, allergic reactions and contact dermatitis, which poses diagnostic difficulties.[6] The scabies incubation period lasts approximately 4–6 weeks, and may possibly be shorter if the initial infestation is heavy. Thus the affected people become a source of infection prior to the institution of treatment. Consequently, all family members and other people sharing the same living quarters should also be treated.[7] However, in the case of reinfection the reaction is noticed quickly, with characteristic skin lesions and itching appearing within 24–48 h. Depending on how advanced the infection is and the type of inflammatory response, the clinical manifestations may vary.[8] In the past people presenting numerous skin lesions were thought to be heavily infested with a high parasite load. This, however, has not been confirmed. The studies carried out by Johnson and Mellanby[8] show that extensive clinical signs may occur even at a small parasite load, while it is possible for people presenting hardly any symptoms to carry a huge parasite burden. If scabies is left untreated, secondary infection often develops. Pyoderma is a result of a secondary infection caused by *A streptococci* and *Staphylococcus aureus*.[9]

3.1.1. *Classical or typical scabies*

One of the main presenting symptoms is pruritus, becoming more intense at night. Skin lesions with a diagnostic value show as typical comma-like or irregular tunnels measuring from a few millimeters up to a few centimeters on rare occasions. The tunnels are burrowed by a female scabies mite which positions itself at the end of the burrow.[10] A study by Johnson and Mellanby[8] involving 886 men with 9 978 mites recovered showed that 63.1% of lesions were found on the skin of the wrists and arms, excluding hands, 10.9% on the elbows, 9.2% on the feet and ankles, 8.4% in the genital area and 4.0% on the buttocks. Further studies involving 119 women and 1 494 mites showed the lesions to be located mostly on the arms and wrists, accounting for 74.3%; 7.5% were found on the hands, 5.9% on the elbows, 8.8% on the feet and ankles and 1.1% on the buttocks.[11]

3.1.2. *Scabies in young children and older people*

In infants and younger children typical lesions including vesicles, pustules and nodules are usually distributed unevenly, with lesions located on hands, feet and natural body creases. Unlike in older children and adults, the head, hands and the soles of the feet may also be affected in infants.[12] In the elderly scabies is often misdiagnosed because the itching may be wrongly attributed to the entity known as senile pruritus, which may hinder the diagnostic process.[13]

3.1.3. *Nodular scabies*

Skin lesions present as round, smooth nodules of 5–8 mm in diameter, with red (or reddish) and brownish coloration. They are found on the areas of very thin skin, such as the genitals or inguinal folds, but the lesions never affect the hands or feet.[14] According to the results of the previous studies, there were no mites identified in the nodules and they are thought to appear as a result of delayed hypersensitivity reaction to the mites and not of an active infection.[15] This stands in opposition to the studies conducted by Czeschik et al.[16] and Liu et al.[17] in which mites were found on the section of the nodules.

3.1.4. *Vesicular scabies or bullous scabies*

This is a rather uncommon variety of scabies usually occurring in elderly people. It may mimic bullous pemphigoid clinically as well as histologically, and may resemble the latter even with immunofluorescence findings. The diagnosis is particularly difficult when epidermal scrapings fail to show the parasite or its feces.[18] It seems likely that the formation of the bullae in these conditions is associated with the prolonged presence of the parasite in the host's epidermis. This may produce a specific immunological response which activates T-helper 2 cells, thus raising the level of interleukin 5 and, in turn, that of eosinophiles with the release of the proteolitic enzymes near the basement lamina, which finally leads to blister formation.[19,20] There has been some debate as to whether these blisters are characteristic of true scabies or are rather due to bullous pemphigoid triggered by the parasite.[21]

3.1.5. *Norwegian scabies (crusted scabies or scabies crustosa)*

In the majority of cases, Norwegian scabies is diagnosed in immunocompromised people. These include patients treated topically or systemically with corticosteroids, HIV-positive people with human T-lymphotropic virus 1 (HTLV-1) infection, systemic lupus erythematosus, rheumatoid arthritis, as well as mentally or physically disabled people.[22,23] Scabies may also affect people whose immunological system is weakened.[24] The incidence rate for Norwegian scabies in the Australian Aboriginal community remains one of the highest rates worldwide.[25] It is estimated that even 50% of children in this community may be infected.[26] In Norwegian scabies, proliferative and hyperkeratotic response is manifested by the formation and accumulation of thick scales. It is probably due to an increased interleukin-4 level.[27] One gram of crusted skin may contain as many as 4 700 mites.[24]

3.2. *Basic diagnostic tools*

3.2.1. *Burrow ink test (BIT)*

The test consists in some ink being applied onto the examined site which is then cleaned with an alcohol soaked swab. The ink allows the tunnel to be seen, showing as a dark irregular track. This method may prove useful in nervous patients or those unwilling to co-operate. This test gives a 30% chance of false negative results.[28]

3.2.2. *Skin scraping*

Collecting skin scrapings is an invasive method. Following an application of one drop of silicone oil onto the skin lesion, with the oil helping scraped material adhere to the blade, samples of affected skin are collected with a sterile scalpel. The collected material is then placed on the microscope slide and covered with a coverslip. The edges are sealed with transparent nail polish to prevent the mites from migrating beyond the coverslip.[29,30] Potassium hydroxide helps to dissolve keratin, which improves visibility, but may dissolve mite pellets.[10]

3.2.3. *The adhesive tape test*

The test makes use of adhesive tape which is placed on a skin lesion and is then transferred, together with small separated parts of corneal skin, onto the microscope slide. It is assumed that *Sarcoptes* mites are found in the epidermis, and its upper layers might be loosened by skin scratching.[31] The advantages of this test include its low cost as well as no need for special training of the staff.[29] The structure of the skin plays a major role in successful collection of mites by means of an adhesive tape. Age-related or otherwise atrophied skin facilitates this process, and so it is possible to detect mites in elderly patients.[31]

3.3. *Advanced diagnostic tools*

3.3.1. *Skin biopsy*

Skin biopsy belongs to the invasive methods and makes it possible to see the mites and eggs in the corneum of the epidermis. However, more often than not, mites are absent and further histologic analysis is likely to reveal nonspecific delayed hypersensitivity reaction. This method shows low diagnostic sensitivity.[32]

3.3.2. *Dermatoscopy and videodermatoscopy*

Both dermatoscopy and videodermatoscopy are non-invasive techniques, in which the skin is watched closely in vivo by means of a dermatoscope providing a magnification power of 10 times and a videodermatoscope providing a magnification power of 10–1 000 times. Both methods can be used to inspect many sites in a short period of time. Videodermatoscopy makes it possible to precisely identify the mite's transparent body and greater magnification power will visualize other important diagnostic elements such as eggs or feces left by the mites.[33] This method is fast, effective and sensitive, particularly in patients whose symptoms are non-specific. At greater magnification important diagnostic elements can be identified, and thus the risk of false positive results, which are sometimes obtained at lower magnification power, can be avoided.[34,35] However, the cost of this equipment often makes it unavailable, except in specialized health care facilities, and so it is not widely used.

3.3.3. *ELISA*

Enzyme-linked immunosorbent assays (ELISAs) have been used in order to detect mange in some domestic animals.[36,37] The reports of specificity and sensitivity of ELISAs vary. The tests, utilizing whole mite extracts, are costly and their preparation is painstaking, as the mites to be cultivated for the assays must be obtained from the appropriate hosts. Moreover, another obstacle to using ELISA for *S. scabiei* var. *hominis* detection is that there is no in vitro culture system for this organism.[38] We should also bear in mind that there is antibody cross-reactivity between scabies mites and house dust mites when whole-mite extracts are used for serodiagnosis in humans.[39]

3.3.4. *PCR*

The diagnostics utilizing the PCR technique is based on the detection of mites in a given sample. The low sensitivity of this test, its high cost and the need for specialized laboratory equipment render PCR impractical in use on a large scale. However, PCR followed by ELISA is thought to be an effective diagnostic technique in patients affected by atypical scabies.[40]

4. Conclusions

Scabies still remains a major public health problem worldwide. Research is hindered mainly due to difficulty in obtaining the material from infested people as well as the lack of an in vitro system. The research is now aimed at improving the diagnostics and implementing better therapeutic options. In the future it will lead to a better understanding of parasite–host interactions, and will thus result in a lower prevalence of scabies.

Conflict of interest

None declared.

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