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Dermatomal Distributed Skin Diseases: A Systematic Review

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ABSTRACT

Dermatomal distribution of cutaneous lesions is a common pattern that encountered in the field of dermatology. Being familiar with these types of patterns can help evaluating the specifically distributed lesions and may shed a light on the diagnosis. This review summarizes the literature about dermatoses that presents with dermatomal distribution.

Keywords: Blaschko, Dermatology, Dermatome, Herpes zoster, Lichen planus, Melanoma, Metastasis, Psoriasis

Introduction

Recognition of patterns is essential assessing the skin diseases. The skin presents a distinct anatomical pattern due to distribution of sensory nerve fibers originate from a single spinal nerve [1]. An area of skin supplied by a single nerve root is called a dermatome. It can be considered as communicating sensation from skin to the brain. Dermatomes are located horizontally on the trunk and this horizontal pattern contrasts with the pattern of the extremities where it is typically longitudinal. Dermatomes can overlap and an individual's exact pattern of dermatome is unique [2].

A zosteriform pattern describes a unilateral belt like or girdle like presentation of a dermatosis on the area of skin that innervated by sensory branch of a spinal nerve [3-5].

While herpes zoster (HZ) is first to remember between zosteriform dermatoses, a large variety of inflammatory, infectious, neoplastic diseases may also present as zosteriform lesions [6].

There are 8 pairs of cervical, 12 pairs of thoracic, 5 pairs lumbar, 5 pairs of sacral and a pair of coccygeal nerves. There are 30 different dermatomes, despite the fact there are 31 pairs of spinal nerves. This results from the fact that C1 spinal nerve typically doesn't have sensory fibers. As a result, dermatomes start from spinal nerve C2.

Even though skin mostly innervated by spinal nerves, the facial skin innervated by cranial nerve V which known as trigeminal nerve [6].

Pathogenesis

Cutaneous diseases that present itself with dermatomal distributed lesions reflects mainly 2 mechanisms.

The isotopic mechanism;

Isotopic response defined as a dermatosis that located and remains restricted to a site; which is the same area that other previously healed skin disease has placed [7-9].

The archetype of this phenomenon is a dermatosis that occurring on the same site of recovered previous HZ.

Although the precise mechanism of isotopic response needs to be enlighten it may be related to varicella zoster virus (VZV) induced modifications of the cutaneous immune system [10].

The neural mechanism;

Neural pathway results from reactivation of latent VZV of neural cells and the cells of dorsal root ganglia. Newly synthesized viral particles transferred to the skin via microtubular system of the axons [11].



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Lines of Blaschko

During embryogenesis, precursor cells start to proliferate on the midline and grow in transversal direction from this line. As the growth progresses these cells set up in S shape in the back and V shape on anterolateral trunk. These lines illustrate ectodermal development patterns. This distribution pattern, especially on the trunk, is frequently hard to distinguish from dermatomes [12].

Herpes Zoster

VZV infection is an important medical entity that concerns many specialties besides dermatology such as infectious diseases and neurology. It can effect variety of individuals from childhood to elderly. Its treatment also requires proficiency in pain management. Varicella generates from acute viremia. HZ appears in later life due to the dormant viral infection. When it is re-activated and virus spreads orthodromically to the target tissue. Generally, one dermatome is involved, however two or three adjoining dermatomes can be effected. The lesions commonly located unilaterally and do not intersect the midline (Figure 1, 2) [13].

If the zosteriform eruption is recent (<10-14 days) HZ is the most plausible diagnosis. However, zosteriform HSV infections are experienced in nearly 25% of the cases diagnosed as HZ at first [14-26]. The differantiation between HSV and VZV can quickly be performed on a Tzanck smear [4]. This difference is important in terms of dosing regimen which is differing from one another [4].

Zosteriform Cutaneous Metastases

Cutaneous skin metastasis results from tumor cells spreading directly and through hematogenous or lymphatics. It is comorbid in 0.7-10% of patients with cancer and composes 2% of cutaneous malignancies. Zosteriform pattern is a rarely seen subtype and there have been less than a hundred case reported [27].



Figure 1. Multiple millimetric papulovesicular eruption on an erythematous basis unilaterally distributed on left side of the trunk

Diagnosis of dermatomal distributed cutaneous metastasis can be tough. It can also prompt untoward investigations, delayed diagnosis and inaccurate treatment.

This sort of distribution pattern has been reported with digestive, respiratory tumors, breast cancer and lymphomas and squamous cell carcinomas (SCC). And the most common sites of metastases were chest and abdominal wall.

Besides the similar location and distribution pattern, patients also reported concomitant pain and that sort of presentation usually leads the physician to HZ and results in administration of antivirals in many cases [28].

Zosteriform cutaneous metastases generating from internal malignancies have also reported. Most frequently in the older patients, lesions with abnormally long duration as well as in patients with a history of cancer.

Cutaneous metastases of breast cancer are the most frequently observed, presumably due to its primary location on the thoracic dermatomes [29-53]. These zosteriform cutaneous metastases may often be initially misdiagnosed as HZ [34,54,55] or as contact eczema [56]. And they are frequently a sign of a poor prognosis and cutaneous metastases have been reported in 0.7-9% of the cancer patients [57]. Although zosteriform distribution of metastases are rare and less known there are few cases reported in the literature.



Figure 2. Multiple millimetric papulovesicular-pustular eruption on an erythematous basis unilaterally distributed on right scapula and upper extremity

Zosteriform Skin Cancers

If the eruption is more long established (more than 14 days), zosteriform distributed primary skin cancers should be considered, predominantly SCC but also angiosarcoma, Kaposi's sarcoma, primary cutaneous B-cell lymphoma and primary cutaneous T-cell lymphoma should be suspected [58-66].

Multiple Eccrine Spiradenomas (ES)

ES is a benign, dermal tumor originating from eccrine sweat glands. It typically presents as a solitary painful lesion, but rarely presents as multiple ES. Multiple ES is estimated to involve less than 2% of total number of cases. And it has increased incidence in females. The etiology of multiple ES is unknown. This diagnosis is aligned with an increased risk of a malignant transformation. Multiple ES can present in a segmental, linear, blaschkoid, or zosteriform pattern [67].

Mycosis Fungoides (MF)

MF presents itself with patches and plaques in the sun protected areas. Variety of clinical forms have been reported including granulomatous MF, hypopigmented MF, folliculotropic MF, pagetoid reticulosis.

Williams et al. [68] reported a case of MF mimicking HZ but immunophenotyping was not performed. In 2017 Rieger et al. [69] reported immunophenotypically and molecularly confirmed zosteriform MF.

Lichen Planus

Lichen planus is an inflammatory mucocutaneous disorder which is characterized by lichenoid, pruritic, shiny, flat papules. In addition to the classical appearance, there are varieties of clinical forms described such as zosteriform lesions. This type of lesions may present zosteriform distribution spontaneously or as Wolf's isotopic response [70-73]. Due to its distribution pattern, it can be also named as linear lichen planus in the literature. Although this rare pattern usually seen as a single dermatomal involvement, occasionally it may represent a multiple dermatomal involvement [74,75].

Melanoma

Zosteriform metastasis is usually painful or pruritic, and is frequently located on a single dermatome, leaving an open door for a potential misdiagnosis [76].

There are six relevant cases reported about recurrence of melanoma in a zosteriform distribution after treatment with chemotherapy [76-81].

Psoriasis

Psoriasis is common, chronic relapsing and remitting inflammatory disease with an overall prevalence of 2% to 3% of the world's population. Koebner phenomenon (KP), also called as isomorphic response, is referred to the occurrence of psoriasiform lesions after trauma on healthy skin sites in psoriatic patients. About 25% of the psoriasis patients develop KP after various traumatic injuries. KP lesions are always located at the site of pre-existed HZ eruption with a latent period of approximately one week to four months from the occurrence of HZ [82]. There are one cases reported in literature each resulting from KP and Wolf isotopic response [82,83].

Other Skin Diseases

Additional skin diseases that may appear as zosteriform pattern include zosteriform perforating collagenosis, unilateral nevoid telangiectasia, zosteriform nevus spilus with melanoma, transient acantholytic dermatosis, progressive cribriform and zosteriform hyperpigmentation, Spitz nevi, epitheloid hemangioma, porokeratosis zosteriform nevus spilus, arterio-venous malformations, and segmental vitiligo may also present with a zosteriform pattern [84-98]. Although there is another publication about segmental vitiligo being a misnomer and rather than a dermatomal distributed disease it may be results from cutaneous mosaicism [99].

Zosteriform inflammatory lesions may appear as drug reactions to levofloxacin [100]. Uncommon cases are accounted for zosteriform morphea [101]. Incidental cases of zosteriform leishmaniosis have been described [102-105].

Conclusion

Dermatomal distribution instantly reminds physicians about HZ. Considering the patients age, competence of their immune system, history of previous dermatoses located in the same area and other relevant diseases such as cancer should be taken into account in order to avoid unnecessary use of antivirals and incorrect diagnoses. Zosteriform cutaneous metastases are not frequent but they are being reported in the literature as a consequence of large variety of cancers.

Ethics

Peer-review: Internally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: S.B., T.K.Ü.U., Concept: S.B., T.K.Ü.U., B.E., S.S., Design: S.B., T.K.Ü.U., B.E., S.S., Data Collection or Processing: S.B., B.E., Analysis or Interpretation: S.B., T.K.Ü.U., B.E., S.S., Literature Search: S.B., Writing: S.B., T.K.Ü.U., S.S.

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