



OBESITY AND SKIN DISEASES

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ABSTRACT

Obesity consists a major nutritional health problem in developed and developing countries, which has reached epidemic proportions. Obesity is defined as the condition of excessive fat accumulation to such an extent that affects the individual's health. obesity is a public health issue which is rapidly increasing and thus needs to be addressed seriously. Overweight and obesity might be a risk factor for some skin diseases. The most common skin diseases among obese patients were striae, planter hyperkeratosis, skin tags, acanthosis nigricans, intertrigo, tinea pedis. There is significance difference were noted between obese patients and control groups in tinea pedis, planter wart, striae, intertrigo, skin tag, planter hyperkeratosis, varicose vein, hirsutism and psoriasis. Dermatologists must work with primary health care physicians and nutritional specialists to reduce incidence of obesity or reduce the effects of obesity on the skin. a high frequency of metabolic, mechanical, inflammatory, infectious and aesthetics disorders in obese individuals and that such disorders should be considered When analyzing adherence to physical activities. Paying attention to skin diseases related to obesity is of paramount importance in order to transmit positive signals to the individual regarding his/her condition as a person, restore his/her health and improve his/her self-image, self-esteem and emotional stability.

KEYWORDS : Obesity, Risk Factors, Skin Diseases, Inflammation; Adipokine; High Fat Diet; Fatty Acids

INTRODUCTION:

Obesity is a chronic disease which has spread all over the world and threatens public global health. The phenomenon of obesity has drawn the attention of the scientific community, organizations and governments worldwide because it affects people's lives negatively and imposes excessive financial implications in every health system. In addition, obesity has been the major interest in health sciences and many research studies have focused not only on the prevalence and the risk factors of obesity but also on the significant consequences on the quality of patients' life. Furthermore, is associated with increased incidence of type 2 diabetes mellitus, hypertension, coronary heart disease, arthritis, sleep apnea, and certain forms of cancer[1-2].

Even though obesity has long been recognized as a vital cause of diabetes and cardiovascular diseases, the impact of obesity on the skin has received minimal attention. However, recent studies have gradually revealed the close relationships between obesity and various skin diseases and skin homeostasis. For example, the epidermal barrier is reported to be impaired in obesity, so that obese individuals show increased trans epidermal water loss (TEWL) and dry skin [3]. Obese individuals also have larger skin folds and sweat more profusely when overheated [4]. Obesity inhibits lymphatic flow[5] and alters collagen formation [5]. The delayed-type hypersensitivity response is increased in obese individuals and decreases with weight reduction [6], which may be related to an alteration in the production of cytokines by adipocytes.

Skin lesions generate significant costs to all involved and influence patient's quality of life, as well as their social, recreational and work relationships. Dermatoses may serve as metabolic markers of obesity and insulin resistance. Depending on their appearance, location and circumstances, they can cause embarrassment and hinder or prevent the practice of physical and sporting activities. They are also associated with the occurrence of ingrown toenails, keratoderms and calluses on the feet and worsening in the severity of psoriasis, seborrhea and diabetes symptoms. Skin lesions may affect the self-esteem of patients, cause discomfort, pain, ergonomic overload and mechanical

limitations in performing certain body movements. Obesity has become an epidemic in many parts of the world. WHO has warned of the escalating epidemic of obesity that could put the population in many countries at risk of developing long-term non-communicable diseases (NCD). Available studies in the Eastern Mediterranean countries indicated that obesity had reached at an alarming level among both children and adults [7]. Obesity is a health problem of considerable magnitude in the western world. Dermatological changes have been reported in patients with obesity, including: acanthosis nigricans and skin tags (due to insulin resistance), hyperandrogenism, striae due to over extension, stasis pigmentation due to peripheral vascular diseases, lymphedema, pathologies associated with augmented folds, morphologic changes in the foot anatomy due to excess load, and complications that may arise from hospitalization.

This Review aims to highlight the association between obesity and dermatologic conditions. We review the impact of obesity on inflammatory and other skin diseases. And also discusses the skin changes that are related to obesity, emphasizing their influence on physical activity and aiming at health promotion and disease prevention.

DISCUSSION:

Studies have shown that skin disorders in obese individuals can vary in severity, prevalence and response to treatment. They are caused by changes in the skin surface pattern (keratosis pilaris, stretch marks, xanthomas, acrochordons, gynecomastia) (8-10); hyperandrogenism and hyperinsulinemia (acanthosis nigricans, acne, hirsutism, androgenetic alopecia) (11-14); increased prevalence of infection (candidiasis, dermatophytosis, folliculitis, furuncles, erythrasma, erysipelas, cellulitis, necrotizing fasciitis) (15-17); decreased venous return (chronic venous insufficiency, lymphedema, stasis dermatitis and delayed healing of wounds) (15). They are also associated with the occurrence of ingrown toenails, keratoderms and calluses on the feet; and worsening in the severity of psoriasis (18-21), seborrhea (22-23) and diabetes symptoms (14, 24). Skin lesions may affect the self-esteem of patients, cause discomfort, pain, ergonomic overload and mechanical limitations in performing certain body movements.

Metabolic skin changes related to obesity The following metabolic manifestations have been detected in obese individuals: acanthosis nigricans,acrochordons, hirsutism and androgenetic alopecia Diabetic dermopathy

Mechanical skin changes related to obesity: The main mechanical manifestation identified in obese individuals was plantar keratoderma . This condition is usually accompanied by ingrown nail,chronic venous insufficiency and lymphedema

Plantar keratoderma:

The thickening of the plantar stratum corneum (plantar hyperkeratosis or thick heel) is considered by some authors to be an obesity stigma, although it is not exclusive of this disorder. It is a multifactorial response to the excessive and repetitive overload to the plantar aspect of the heel may represent a risk of development of foot injuries. This condition is usually associated with calluses, fissures, infections and gait disorders, which limits physical activity [24].

Ingrown nail:

Ingrown or incarnated nails (onychocryptosis) are frequently found in the hallux of obese individuals due to factors such as foot shape, nail anatomy, use of tight shoes, hygiene habits, skin or systemic diseases. Ingrown nails hinder physical activity participation due edema, pain, local infection, musculoskeletal and joint overload, and postural changes. Weight loss leads to the improvement of foot edemas, nail trauma and plantar keratoderma, which, in turn, improves adhesion to walking and exercise programs. The recovery of gait autonomy facilitates obesity control .Obesity is a risk factor for chronic venous insufficiency in both men and women. Increased intra abdominal pressure increases resistance to venous return and leads to the development of stasis eczema, ocher dermatitis, lymphedema, leg ulcers and recurrent infections. This condition is associated with edema, pain and discomfort, resulting in a negative cycle of decreased mobility, increased inactivity and weight gain. In cases of infections and orthopedic or post-surgical situations, the drastic interruption of physical effort and the decreased energy expenditure at work and in daily life - associated with psychological factors - contribute to weight gain .

Infectious skin changes related to obesity:

Studies with obese patients indicate an increased incidence of candidiasis, dermatophytosis, folliculitis, furuncles, erythrasma, hidradenitis suppurativa, erysipelas and cellulitis. During infectious processes patients may be instructed to temporarily avoid the practice of physical activities in order to prevent worsening of the condition and disease dissemination to the community. However, weight reduction associated with extra local care aids in the control of infections and in the prevention of conditions. Longterm adherence to physical exercise shows positive impact on patient health [25].

Inflammatory skin changes related to obesity:

Obesity changes cell composition in adipose tissues:

Inflammatory skin diseases are generally exacerbated by obesity, but the mechanism of this exacerbation has not been fully elucidated. It has been reported, however, that changes in cell composition in adipose tissues are important for the development of systemic diseases such as diabetes in obesity. Adipose tissues are composed not of adipocytes alone but rather of a variety of other cell types, collectively termed the stromal vascular fraction (SVF). This fraction includes mesenchymal stem cells, vascular endothelial cells, nerve cells, macrophages, T cells and B cells. In 2003,pioneering studies by Xu *et al.* and Weisberg *et al.* reported that obesity is associated with significant increases in the proportion of macrophages in the SVF in both visceral and subcutaneous

adipose tissues [25-26]. Flow cytometric analysis has shown that macrophages account for approximately 40% of the SVF in obese rodents, whereas it accounts for only 10% in lean littermates. The gene expression profile of adipose tissues from multiple obese mouse models demonstrates that macrophage-related genes are upregulated in obese animals. Recruitment of macrophages into adipose tissues is an early event in obesity-induced adipose inflammation. The monocyte chemo attractant protein-1 (MCP-1)/CCL2, one of the major chemo attractants for macrophages via CCR2,is secreted primarily by macrophages and vascular endothelial cells, and also by adipocytes. Adipose tissue macrophages (ATMs) express CCR2 and recruit additional monocytes/macrophages, promoting a feed-forward process. As it is reported that macrophages play an important role in inflammatory skin diseases such as contact dermatitis and psoriasis, an increase in ATM in adipose tissues in the skin (subcutaneous and intradermal adipose tissues) may contribute to the deterioration of inflammatory skin diseases [25-26].

Fatty acids and inflammation:

Fatty acids, such as saturated fatty acids and trans fatty acids, are abundantly contained in HFD, which is considered a cause of obesity [27]. There are several papers that show the direct effects of fatty acids on immune functions. Obesity is one of the important causal factors of many inflammatory diseases. In the skin, functional changes in both adipocytes and lymphatic vessels and epidermal keratinocytes are suspected to be involved in the obesity-induced exacerbation of skin inflammation. How obesity causes inflammation is still not well understood, but future research will reveal these mechanisms, enabling the development of new treatments for inflammatory skin diseases is expected.

Eczema and atopic dermatitis:

Eczema, the most common inflammatory skin disease, is estimated to have affected 245 million people globally in 2015. In the United States, it affects about 10%–30% of people. Eczema, also known as dermatitis, is a clinical and histopathological pattern of skin inflammation that presents as pruritus, skin dryness and erythema . Eczema may result in skin lichenification, and severe eczema is the most common cause of erythroderma. Quality of life for patients and their families may be considerably reduced and occupational issues may add to the financial consequences. Although the underlying mechanisms by which obesity causes eczema and atopic dermatitis remain largely unknown, various mechanisms have been proposed, including obesity-induced exacerbation of skin inflammation [28].

Psoriasis:

Psoriasis encompasses a group of related inflammatory skin diseases that affect up to 3% of the population. These diseases are heritable and over 40 genetic susceptibility loci have been identified, many of which are involved in antigen presentation, cytokine signaling, or innate antimicrobial responses. The most common presentation of psoriasis is plaque psoriasis but the disease is clinically heterogeneous in its manifestations and natural history depending on the age of the patient, environmental triggers, and the sites affected. Treatments include topical agents for disease of limited extent, phototherapy (UVB and PUVA), and systemic therapy (methotrexate,cyclosporine, acitretin and fumarates) formore extensive disease, and biological treatment (inhibitors for tumor necrosis factor , IL-23 and IL-17) for severe resistant psoriasis [29]

Aesthetic skin changes related to obesity:

Stretch marks:

Stretch marks are linear dermal plaques accompanied by epidermal atrophy that appear along lines perpendicular to

the direction of greatest tension and are directly related to stretching of the skin. Common distributions cover areas with the most adipose tissue, such as the breasts, lateral abdomen, buttocks, and thighs. Striae progress through several phases and colors, initially erythematous (striae rubra), then violaceous, and finally white, atrophic, and depressed plaques (striae alba). Though its pathogenesis is controversial, striae distensae are closely related to obesity. The incidence of striae was higher in those with a longer duration of obesity. In a study of urinary steroid excretion in obese patients, urinary adrenocorticosteroids were significantly greater in obese patients, particularly in those with red abdominal striae, when compared to a normalweight control group. In another study, Angeli et al found the clinical appearance of striae in obese individuals as lighter, narrower, and less atrophic than the Cushingoid appearance. Regardless of the type of regimen, weight loss does not change the degree of striae distensae. Numerous therapeutic strategies ranging from topical applications to lasers are available, yet no single modality has been more consistent than the rest. Further development of effective treatment options for these patients is a much-needed area of research [30].

Cellulites:

Gynoid lipodystrophy (cellulitis) has an unknown etiology and is common in women after puberty. Cellulitis is influenced by sedentary lifestyle, obesity, heredity, age, sex, pregnancy, use of hormonal contraceptives, hormonal disorders, smoking, inadequate nutrition, circulatory changes and mechanical factors. It changes the appearance, the shape and the size of the thighs, the abdomen and the gluteal region, giving a corrugated nodular (orange peel-like) appearance to the skin. Despite causing discomfort and pain, this condition tends to be under diagnosed because patients are often too embarrassed to seek medical attention. The dissatisfaction with the body and sometimes rejection of the body, the occurrence of social, professional or family disturbances, and the presence of existing comorbidities and skin diseases affects the lifestyle of obese individuals and may jeopardize their ability to perform daily tasks and their motivation to practice physical activities. Social inhibition occurs due to shame, frustration, hopelessness, stigmatization, segregation, depression and anxiety [31].

Future prospects:

Obesity is one of the important causal factors of many inflammatory diseases. In the skin, functional changes in both adipocytes and lymphatic vessels and epidermal keratinocytes are suspected to be involved in the obesity-induced exacerbation of skin inflammation. As the largest organ in the body, the skin has several important roles including immune and defense functions that protect us from the external environment. In obesity, this function is impaired. The increasing changes in eating habits and energy expenditure patterns, resulting from industrial and technological advances are likely to increase the tendency toward obesity or overweight in genetically susceptible individuals exposed to unfavorable environmental factors. The skin bears the consequences of both the internal and external environments, culminating in pathology, which can ultimately impact the health and quality of life of obese patients. Since the obesity epidemic is on the rise in the U.S. and elsewhere, a comprehensive understanding of the obesomatoses is essential for the practicing dermatologist. Dermatologists must work with primary health care physicians and nutritional specialists to reduce incidence of obesity or reduce the effects of obesity on the skin. Not only does the mechanical force created by the obese patient's extra weight cause a host of conditions, but the endocrinologic abnormalities associated with obesity can cause a variety of other skin diseases. The effect obesity has on the skin is so

significant that many of the aforementioned conditions can occur in patients without any other identifiable risk factors. This fact alone should cause clinicians to consider Body Mass Index (BMI) evaluation as a crucial component of any dermatologic examination. Seeking medical help is an essential step because it helps to reduce morbidity and mortality rates among obese individuals. Considering that the approach to individuals with obesity includes the implementation of strategies for the promotion, protection and recovery of health, the reduction of dermatologically related limitations together with the personalized prescription of regular physical activity play an important role in promoting global health care. Paying attention to skin diseases related to obesity is of paramount importance in order to transmit positive signals to the individual regarding his/her condition as a person, restore his/her health and improve his/her self-image, self-esteem and emotional stability. Regular physical activity is essential in this process. It is recommended for fitness, therapy, recreation and socialization, and minimizes or eliminates damage, injuries, emotional and financial costs to current or former obese individuals, their families and the community.

This review showed that there is a high frequency of metabolic, mechanical, inflammatory, infectious and aesthetics disorders in obese individuals and that such disorders should be considered when analyzing adherence to physical activities.

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