The role of Obesity in Pressure Injury Risk

Obesity, (BMI ≥30), and especially morbid obesity (BMI ≥40), has a profound impact on the health and integrity of the patient's integumentary system [1].

Given the complex structure and barrier function of skin, loss of skin integrity can be quite serious, possibly resulting in infection, pain, damaged self-esteem, body odour, and altered mobility. Skin injuries among obese and morbidly obese individuals can pose serious to life-threatening clinical care situations [1].

Skin changes in the bariatric person increase the risk of skin damage, impaired healing, and development of skin conditions [2].

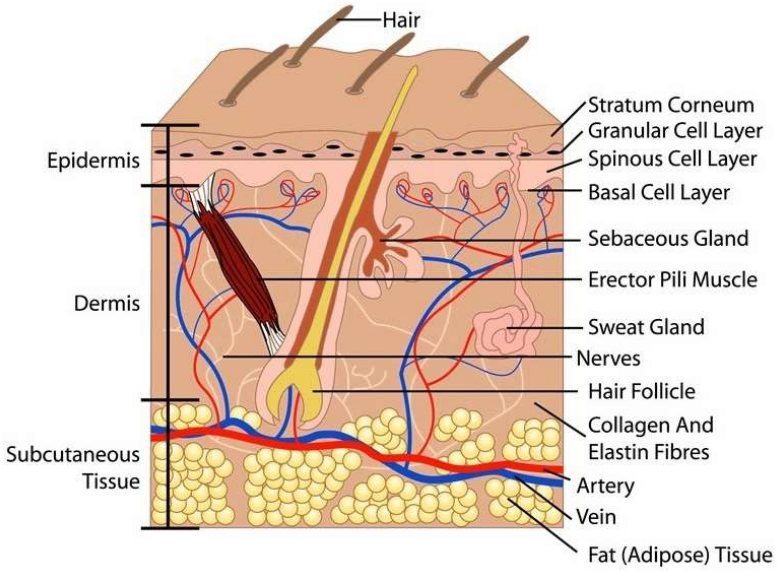
THE SKIN

The skin is the largest organ of the body. The skin and its derivatives make up the integumentary system, a complex system responsible for function and protection of the body.

The reticular layer is the bottom layer of the dermis. It's thick, and it contains blood vessels, glands, hair follicles, lymphatics, nerves and fat cells. A net-like structure of elastin fibres and collagen fibres surrounds the reticular dermis. These fibres support your skin's overall structure, as well as allow it to move and stretch.

The papillary layer is the top layer of your dermis. It consists of collagen fibres, fibroblast cells, fat cells, blood vessels (capillary loops), nerve fibres, touch receptors and cells that fight bacteria (phagocytes). The papillary dermis extends to the basement layer of the epidermis layer.

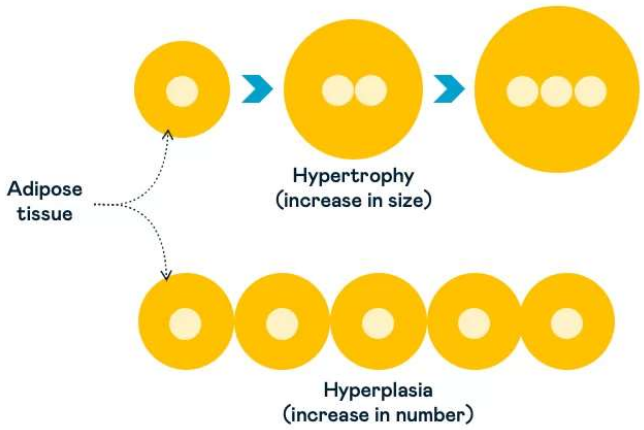
Below the dermis lies a layer of fat that helps insulate the body from heat and cold, provides protective padding, and serves as an energy storage area. The fat is contained in living cells, called fat cells, held together by fibrous tissue.



ADIPOSE TISSUE

Adipose tissue is a unique multifunctional organ serving not only as a simple storage of excess energy, but also as connective tissue, a metabolic organ, endocrine organ, and source of stem cells [3].

Obesity induces a complex remodeling of adipose tissue, which expands to accommodate the excessive caloric intake and markedly changes its structure and cellular composition [4]. Adipose tissue becomes dysfunctional, promoting a pro-inflammatory, hyperlipidemic and insulin resistant environment.



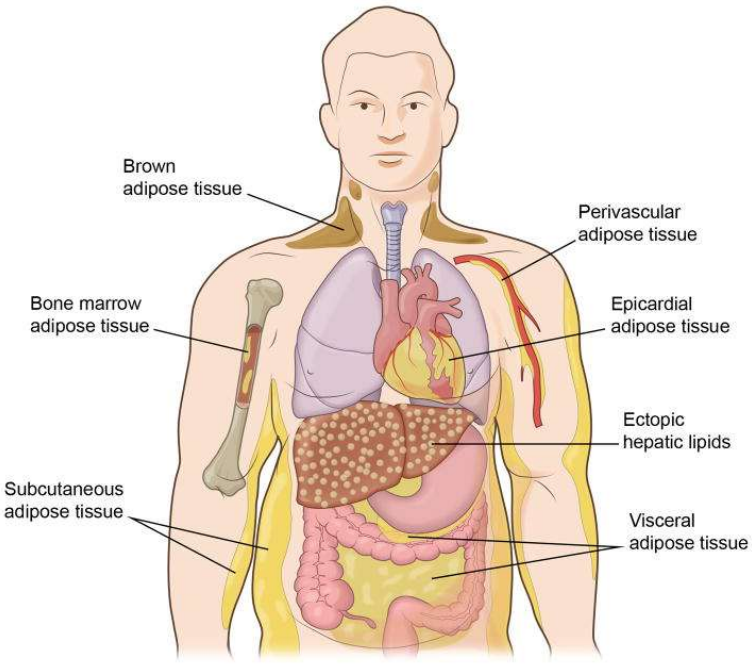
Adipose tissue has two ways it can store excess fat. Hypertrophy (increase in cell size) or Hyperplasia (increase in cell number).

Adipose tissue can be classified by morphology into white, brown, or beige subsets. In addition, white adipose tissue can be broadly classified by location, largely defined as subcutaneous (located under the skin) and visceral/omental (located intra-abdominally, adjacent to internal organs)

Adipose tissue depots occur throughout the body. Visceral adipose tissue accumulation is a major risk factor for cardio-metabolic disease, whereas subcutaneous fat appears to be neutral or protective.

Other adipose tissue depots of note include the epicardium, the perivascular space, and bone marrow, but the functional significance of these tissues is largely unknown.

Brown adipose tissue occurs in the supraclavicular and paraspinal regions.



In contrast to white adipose tissue, brown adipose tissue is very metabolically active and it functions to utilise fuel to produce heat. In addition, ectopic lipid can accumulate in tissues of organs, such as liver, in metabolically dysfunctional systems.

INTRINSIC RISK FACTORS

Obesity is responsible for changes in skin barrier function [5]. The increase in stored fat associated with obesity can contribute to a variety of changes in skin physiology and is implicated in a range of dermatologic conditions [6].

Changes in the physiology of the skin in obesity include:

- Relatively reduction in blood supply, leading to poor perfusion and inadequate oxygenation
- Altered epidermal barrier leading to increased trans epidermal water loss resulting in dryness and delayed skin repair
- Increased insulation, trapping heat, increasing core temperature, and causing excessive sweating
- Increased production of sebum by the sebaceous glands, increased oils
- A thickened layer of subcutaneous fat leading to larger skin folds and increased sweating (hyperhidrosis)
- Impaired lymphatic flow in the subcutaneous tissue leading to lymphoedema
- Impaired collagen structure and production leading to poor wound healing.
- Poor nutrition - inadequate protein, vitamins, and nutrients essential for skin health and repair
- Changes in microcirculation and microcirculation
- Decreased cardiovascular ability to supply oxygen and nutrients
- Respiratory changes impeding blood oxygenation
- Skin folds and tissue obstruction of vascular system
- Fluid retention and poor circulation secondary to heart and kidney disease (diaphoresis)

Mechanical factors affecting the skin relating to obesity include:

- Increased pressure on the feet due to the weight
- Stretching of the skin during weight gain
- Increased roughness of the skin increasing friction
- Increased moisture and friction between the skin folds
- Decreased sensitivity to pain due to poor vascularisation to nerve endings
- Other skin conditions are related to hyperinsulinaemia in the metabolic syndrome
- Increased friction, and shear due to the substantial weight stress on the skin
- Presence of subcutaneous fat and skin folds – changes in movement and momentum
- Difficulty performing sufficient skin hygiene

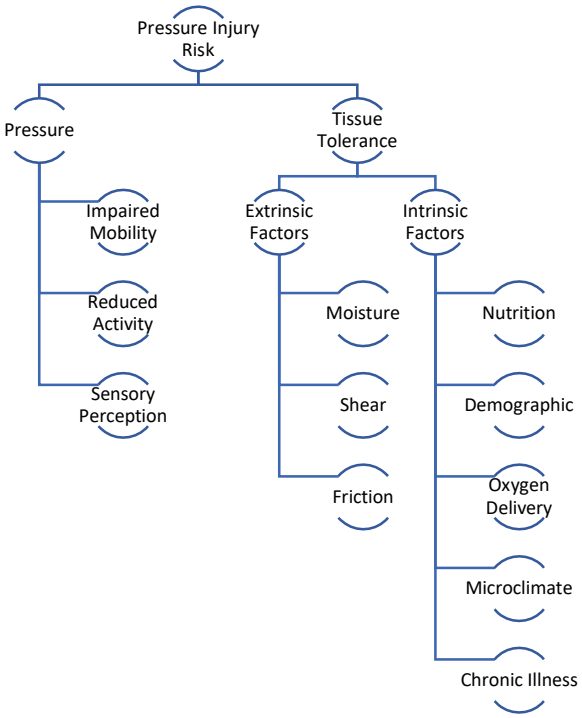
Resultant condition:

- Immobility – decreased ability to reposition and offload tissues
- Excessive heat, perspiration and moisture
- Increased susceptibility to shear and friction
- Increased force on weight bearing surfaces
- Pressure occurring due to the interaction of skin folds and body parts
- Poor skin condition and healing potential

The complex skin issues and the potentially devastating consequences if an individual with obesity develops skin breakdown make it imperative that all obese individuals receive a complete and thorough skin assessment with hope of preparing clinicians to identify and prevent these skin conditions before they become complex issues [6].

PRESSURE INJURY

The obesity condition contributes considerably to the risk of Pressure Injury. In the presence of pressure, or pressure and shear, a Pressure Injury can be caused [7]. Intrinsic risk factors associated with obesity impact tissue tolerance and can facilitate impaired mobility leading to a heightened level of risk.



Pressure injuries that develop in the obese population have slightly different characteristics because the pressure is distributed differently.

In patients of normal weight, high pressure points are seen over bony prominences. With the obese patient, a large amount of mass induced force is distributed over the entire weight bearing surface, as well as the bony prominences.

External sources of pressure become of increased importance across the entire skin surface.

Atypical pressure injuries may develop [6] including skin folds excepting pressure on each other [1].

Ultimately, a good Pressure Injury risk assessment involves a holistic review of the person, including their health, environment, and care needs.

It is essential to implement an individualised Pressure Injury Prevention plan incorporating equipment specific to the person's somatotype, physical, cognitive, behavioural, and medical requirements. The impact of incorrect equipment prescription can contribute to the external risk factors and directly contribute to further risk to the skin and tissues.

As part of the multifactorial intervention, pressure care surfaces should be implemented in the bed and chair along with regular repositioning to moderate the risk of pressure in a system where tissue tolerance is compromised.

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