Paradigm Academic Press
Innovation in Science and Technology
ISSN 2788-7030
SEP. 2023 VOL.2, NO.5

Panniculus Morbidus: A New Global Health Crisis Due to Extreme Obesity

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doi:10.56397/IST.2023.09.01

Abstract

At present panniculus morbidus becomes a cause of various physical complications, such as chronic cellulitis, skin rashes, intertriginous dermatitis, subcutaneous abscesses, folliculitis, skin ulcerations, fistulas, and ischemic panniculitis. Panniculus is seemed as an apron of an extremely large fold of excess skin, tissue, and fat hanging from the abdomen below the waistline and even down to the groin. It is extremely unsightly, painful, and susceptible to various infections. It is found in people who are severely obese, after extreme weight loss (usually 100 pounds or more) through the diet, fasting, and exercise or following gastric restrictive surgery. Medicine, exercise, diet or any other mechanism cannot cure panniculus morbidus; and in this stage, bariatric surgery is needed for the welfare of the panniculus patients.

Keywords: panniculus, morbid obesity, massive weight loss, abdominoplasty, panniculectomy, bariatric surgery

1. Introduction

We are living in the 21st century on the peak of scientific development and health conscious environment. But, a new health-crisis, panniculus morbidus, due to extreme obesity (BMI ≥40) has emerged globally. Panniculus morbidus is a debilitating complication of longstanding obesity (Felmerer et al., 2012; Mohajan & Mohajan, 2013a). Obesity heavily depends on lifestyle factors, such as low rates of physical activity and chronic overeating, unhealthy societal eating habits, food deserts, and the disorder of the carbohydrate metabolism (Kahraman et al., 2015). Massive obesity level in the USA has reached epidemic proportions. Therefore, in the near future panniculus morbidus will be more prevalent in the USA. It may develop in Europe and some other developed countries of Asia and Africa (Friedrich et al., 2008).

Panniculus morbidus is a serious problems related to skin. The skin is the largest organ of human body that books about 15% of the total body weight. It protects us against external physical, chemical, and biologic assailants, and also prevents excess water loss from the body and plays a leading role in thermoregulation (Kanitakis, 2002). Panniculus morbidus; sometimes calls abdominal elephantiasis, is a rare end stage complication of abdominal obesity. The excess abdominal skin and subcutaneous tissue induced by severe lymphedema, hang from the abdomen below the waistline, even may hang nearly to the knees or lower even to the floor (Winicki et al., 2022).

A large panniculus can lead to severe impacts on patients' mobility and daily life activities, and ultimately compel to become housebound. At this stage the patient achieves poor personal hygiene and an impaired quality of life (Fadel et al., 2017). Usually it is seen with massive obesity, following pregnancy, or after significant weight loss. Sometimes panniculus can develop an infraumbilical abdominal hernia (Sugerman et al., 1996).

2. Literature Review

In any research, the literature review section is an introductory unit of research, where works of previous researchers are presented in brief that helps the novice researchers to understand the subject area (Creswell, 2007; Polit & Hungler, 2013). Marianne A. B. van der Sande and her coworkers in their survey have found that individuals with a higher BMI and higher concentrations of glucose, cholesterol, triglycerides and uric acid, depend on their family history; and their risk of obesity and diabetes also depend on their family history (van der Sande et al., 2001). Jeffrey B. Friedrich and his coauthors have found that panniculus morbidus prevents hygiene, leading to a profound odor and ultimately develops in intertrigo, cellulitis, and/or abdominal ulceration. They have observed that during the salvage procedure the wound created is huge and difficult to manage (Friedrich et al., 2008).

Michael Dias and his coworkers have demonstrated that surgical site skin infections (SSSIs) are common in women with severe obesity, and have identified some potentially modifiable risk factors. They have shown that to undertake an exploratory evaluation of clinical outcomes in women with a supra-panniculus transverse compared to an infra-panniculus transverse skin incision (Dias et al., 2019). Nolan M. Winicki and his coauthors have observed that the treatment of abdominal panniculus morbidus is limited and does not fully explore techniques for the safe concomitant management of multiple gastrointestinal hernias. They have realized that both panniculus morbidus and gastrointestinal hernias can be effectively managed concomitantly with a panniculectomy. Hence, ultimately patient's quality of life is improved, pain is reduced, mobility is improved and future weight loss is facilitated (Winicki et al., 2022).

Juarez M. Avelar has realized that an abdominoplasty procedure that combines resection of excess skin with lipoplasty but without panniculus undermining or resection (Avelar, 2002). Shayoni Nag and her coauthors aim to evaluate the outcomes of panniculectomy with gynecological surgery on a national scale in the obese and morbidly obese patient population (Nag, 2021). Michael G. Fadel and his coworkers have investigated a 52-year-old female patient presented with a massive abdominal wall swelling that adversely affected her lifestyle. From the study they have described the surgical technique used to retract the lymphoedematous tissue that facilitates excisional surgery. They have also deliberated the pathophysiology of this condition and the possible contribution of venous obstruction to the development of subcutaneous oedema (Fadel et al., 2017).

Jason A. Spector and his coauthors have observed that in response to the global rise in obesity, bariatric surgery of panniculus has become increasingly more popular and successful (Spector et al., 2006). Konstantinos Seretis presents a modern abdominoplasty approach that combines technical elements and evidencebased medicine to achieve safe and consistent aesthetic outcomes and high patient satisfaction rates with limiting the risk of complications. He has used a meticulous lipoabdominoplasty technique thorough anatomical and surgical knowledge, and the artistic acumen of a plastic surgeon (Seretis, 2021).

3. Research Methodology of the Study

Research is a logical and systematic search for new useful information on a specific topic, which investigates to find solutions of scientific and social problems through systematic analysis (Rajasekar et al., 2013). For the leading in the academic world an academician takes the research as an essential and influential work of his/her way of life (Pandey & Pandey, 2015). Methodology is the organized and meaningful procedural works in any creative research that follow scientific methods efficiently (Kothari, 2008). It is the systematic and theoretical analysis of the methods applied to a field of study. Therefore, research methodology is the science of studying how research is done scientifically (Patel & Patel, 2019).

We have started our main research through the analysis of causes and symptoms of panniculus development. Then we have tried to discuss complications and treatment procedures of panniculus morbidus. To prepare this paper we have taken help from the secondary data sources. We have consulted the books, handbooks, and theses of famous authors. We have also collected valuable information from websites and internets to enrich the paper (Mohajan, 2018a, b, 2020).

4. Objective of the Study

The main objective of this study is to discuss the aspects of panniculus morbidus and its various negative effects in daily life of patients. Other minor objectives of this study are as follows:

- to show causes of panniculus development in abdomen,
- to highlight on symptoms of panniculus morbidus, and
- to focus on the complications and treatment techniques of panniculus morbidus.

5. Causes of Panniculus Development

When a person's body mass index (BMI) becomes more than 40, s/he is considered as an extreme obese person.

At this stage s/he has a risk to develop panniculus morbidus. Her/his massive weight can create an obstruction of lymphatic channels to reduce in the drainage capacity of the lymphatic system (Szuba & Rockson, 1998). Some other factors, such as reflux and obstruction in the valveless superficial veins of the anterior abdominal wall also happened. Then a build-up of fluid swelled in the abdomen which causes the oedema (Rozen & Ashton, 2012).

In oedema, gravitational forces act on the massive accumulation of protein-rich interstitial fluid, and the weight of this fluid stretches the skin of the swelling. Also impairing lymphatic and venous drainage increases the size of the abdominal swelling. In this situation, the normal equilibrium of Starling's forces is upset in a positive response (Michel et al., 2022). Protein-rich fluid in the dermis and subcutaneous tissue accumulate in non-pitting oedema. The thick, stiff and scarred fluid creates the cobblestone in the epidermis that is colonized with bacteria and fungi. At this stage proper treatment is necessary to protect the more development of the epidermis (Kohli et al., 2013).

If it is left untreated, it can cause ichthyosis and cellulitis. Then the radius of the swelling increases according to the Young-Laplace equation (Basford, 2002),

$$\Delta P = -\tau\left(\frac{1}{r_1}+\frac{1}{r_2}\right), \tag{1}$$

where $\Delta P =$ Laplace pressure , r_1 and r_2 are the radii of principal curvatures, and τ is the surface tension of the non-Newtonian fluid. In this situation, the tension exceeds the mean arterial pressure ischaemic ulceration of the skin. Finally, the panniculus is developed gradually over a substantial period of time (Fadel et al., 2017).

6. Symptoms of Panniculus

Panniculus can be formed after rapid massive weight loss due to strict exercise, severe fasting or dieting. The abdominal fat is successfully reduced, but excess skin hangs loosely over the area (Cunningham & Klein, 2007). The overlying skin may be erythematous, hyperpigmented and indurated, with evidence of peau d'orange inferiorly (Fadel et al., 2017). When panniculus morbidus hangs up to floor is considered as the end stage of abdominal obesity, and then patients often develop a reduction in mobility, and may eventually become completely bedbound, and gradually increase the risk of mortality (Evans et al., 2014).

Morbidly obese patients with a large panniculus are disabled in physically, psychosocially, and socially (Nag, 2021). They often feel unhappy with the hanging folds of skin and subcutaneous tissue that remain. Panniculus is very ugly and unpleasant, painful and susceptible to multiple infections for them. In serious condition diet and exercise have not worked at all, and bariatric surgery is needed (Spector et al., 2006).

Panniculus emits a profound odor, and the patients are unable to engage in physical activity, increase infection risk, and decrease quality of life. The only two alternatives are present before these patients: i) to live/die with the mass or ii) to undergo resection (Friedrich et al., 2008). Panniculus can be removed through the abdominal panniculectomy that is clearly a palliative, salvage procedure for morbidly obese patients (Winicki et al., 2022).

7. Complications of Panniculus

Panniculus morbidus is associated with increasing levels of obesity. It is caused by obstruction of lymphatic channels leading to the hypertrophy of skin and subcutaneous tissues (Fadel et al., 2017). Pregnancies, abdominal surgeries, aging, and significant weight loss are caused of panniculus morbidus. The panniculus is causing medical problems that interfere with a person's everyday functioning, such as difficulty fitting into clothing, interference with personal hygiene, impaired ambulation and be associated with lower back pain or pain in the panniculus (Coon et al., 2010). Sometimes lymphoedema is seen in the abdominal wall, where panniculus morbidus is developed and it is a rare entity (Fadel et al., 2017). Abdominal skin redundancy may occur among obese women after pregnancy (Winicki et al., 2022).

8. Treatment of Panniculus

Bariatric surgery of panniculus has become popular largely because of improved outcomes, enhanced patient safety and superior techniques and devices (Trus et al., 2005). A panniculectomy is a common procedure in plastic surgery, and often performed to remove excess tissue, such as panniculus morbidus that does not resolve after medical treatment (Hopkins et al., 2000). This surgery has been established to improve long-term quality of life, positively affecting patients' self-esteem and improving their social lives, work-ability, sexual activity, and physical activity (Modarressi et al., 2013).

Abdominoplasty or "tummy tuck" is one of the top five cosmetic plastic surgery procedures performed in the USA (Shermak, 2020). It is a procedure that flattens the abdomen by removing extra fat and skin from the

anterior abdominal wall (Aranmolate et al., 2022). It is one of the most popular aesthetic operations performed worldwide. It has gained in popularity due to the advances in concepts and techniques (Seretis, 2021). It is done if the patient has a big belly; excess skin and fat are removed from the middle and lower abdomen and tightens the belly muscles (Seung-Jun & Thaller, 2002). It may be combined with breast surgery for post-partum women, and for men with gynecomastia, and surgery on the lower back and/or thigh region, waist, and upper and lower extremities for both gender (Xia et al., 2019). In 1899, the abdominoplasty is described by American gynecologist Howard Atwood Kelly (1858-1943), who performed an elliptical horizontal abdominal panniculus resection including the umbilical area (Kelly, 1899).

Lipoabdominoplasty is the combination of liposuction with traditional abdominoplasty. It aims not only to correct the musculofascial wall laxity and remove the excess skin and adipose tissue of the lower abdomen, but also to define the entire abdomen and flanks, enhancing the long-term aesthetic outcome (Gould et al., 2018; Seretis, 2021). It is characterized by adequate preservation of the blood supply of the abdomen that focuses on the pertinent anatomy. It uses relevant surgical algorithms and techniques to completely address each anatomical area and layer (Matarasso, 1995).

9. Conclusions

In this study we have realized that abdominal panniculus morbidus is a rare condition that has a strong correlation between obesity and abdominal wall lymphedema. Although massive weight loss makes an extreme obese individual very happy; often makes unhappy with the development of panniculus morbidus, the hanging folds of skin and subcutaneous tissue below the waistline or even in floor. The surgery is needed for severely cases to restore or improve the functional impairment of panniculus morbidus that provides physical and psychological well-being of the afflicted morbidly obese patients. Early diagnosis and treatment are essential to alleviate the morbidity and mortality risks related to panniculus morbidus, and we have appreciated that panniculus morbidus ultimately heals.

References

Aranmolate, A. R., et al., (2022). Abdominoplasty: My Experience in the Last 5 Years in Nigeria - Abdominoplasty in Africans. *Reconstructive Surgery & Anaplastology*, *11*(3), 10-14.

Avelar, J. M., (2002). Abdominoplasty without Panniculus Undermining and Resection: Analysis and 3-Year Follow-up of 97 Consecutive Cases. *Aesthetic Surgery Journal*, *22*(1), 16-25.

Basford, J. R., (2002). The Law of Laplace and Its Relevance to Contemporary Medicine and Rehabilitation. *Archives of Physical Medicine and Rehabilitation*, *83*(8), 1165-1170.

Coon, D. et al., (2010). Multiple Procedures and Staging in the Massive Weight Loss Population. *Plastic and Reconstructive Surgery*, *125*(2), 691-698.

Creswell, J. W., (2007). *Qualitative Inquiry and Research Design: Choosing Among Five Approaches*. Thousand Oaks, CA: Sage Publications.

Dias, M. et al., (2019). Predictors of Surgical Site Skin Infection and Clinical Outcome at Caesarean Section in the Very Severely Obese: A Retrospective Cohort Study. *PLoS ONE*, *14*(6), e0216157.

Evans, C. et al., (2014). Massive Panniculectomy Results in Improved Functional Outcome. *American Journal of Surgery*, 207, 441-444.

Fadel, M. G. et al., (2017). Panniculus Morbidus: Obesity-Related Abdominal Wall Lymphoedema. *BMJ Case Reports*, doi: 10.1136/bcr-2016-219023

Felmerer, G., Karcz, W., Foldi, E., & Tobbia, D., (2012). Integrated Concept of Treatment for Reduction of Morbidity after Resection of Panniculus Morbidus Associated with Lymphoedema. *Journal of Plastic Surgery and Hand Surgery*, *46*(3–4), 172-176.

Friedrich, J. B. et al., (2008). Resection of Panniculus Morbidus: A Salvage Procedure with a Steep Learning Curve. *Plastic and Reconstructive Surgery*, *121*(1), 108-114.

Gould, D. J. et al., (2018). Seroma Rates are Not Increased When Combining Liposuction with Progressive Tension Suture Abdominoplasty: A Retrospective Cohort Study of 619 Patients. *Aesthetic Surgery Journal*, *38*(7), 763-769.

Hopkins, M. P. et al., (2000). Panniculectomy at the Time of Gynecologic Surgery in Morbidly Obese Patients. *American Journal of Obstetrics and Gynecology*, *182*(6), 1502-1505.

Kahraman, G., Bas, T., & Akbolat, M., (2015). The Effect of Health Programs on the Development of Attıtudes and Beliefs in Obesity. *Acibadem University Journal of Health Sciences*, *6*(2), 89-98.

Kanitakis, J., (2002). Anatomy, Histology and Immunohistochemistry of Normal Human Skin. *European*

Journal of Dermatology, 12(4), 390-401.

Kelly, H. A., (1899). Report of Gynecological Cases. *Johns Hopkins Medical Journal*, 10, 197-201.

Kohli, R., Argento, V., & Amoateng-Adjepong, Y., (2013). Obesity-Associated Abdominal Elephantiasis. *Case Reports in Medicine*, 2013, 626739, 1-3.

Kothari, C. R., (2008). *Research Methodology: Methods and Techniques* (2nd Ed.). New Delhi: New Age International (P) Ltd.

Cunningham, S. C., & Klein, R. V., (2007). Nomenclature Question: Panniculus or Pannus? Answer: Pannona. *Journal of the American College of Surgeons, 204*(4), 726-727.

Matarasso, A., (1995). Liposuction as an Adjunct to Full Abdominoplasty. *Plastic and Reconstructive Surgery*, 95, 829-836.

Michel, C. C. et al., (2022). Understanding and Extending the Starling Principle. *Acta Anaesthesiologica Scandinavica, 64*(8), 1032-1037.

Modarressi, A., et al., (2013). Plastic Surgery After Gastric Bypass Improves Long-Term Quality of Life. *Obesity Surgery, 23*(1), 24-30.

Mohajan, D., & Mohajan, H. K., (2023a). Obesity and Its Related Diseases: A New Escalating Alarming in Global Health. *Journal of Innovations in Medical Research, 2*(3), 12-23.

Nag, S., (2021). Panniculectomy Performed in Conjunction with Gynecologic Surgery in Obese and Morbidly Obese Patients: A National Surgical Quality Improvement Program Analysis and Systematic Review of the Literature. *Annals of Plastic Surgery, 87*(5), 600-605.

Pandey, P., & Pandey, M. M., (2015). *Research Methodology: Tools and Techniques*. Bridge Center, Romania, European Union.

Patel, M., & Patel, N., (2019). Exploring Research Methodology: Review Article. *International Journal of Research & Review, 6*(3), 48-55.

Polit, D. F., & Hungler, B. P., (2013). *Essentials of Nursing Research: Methods, Appraisal, and Utilization* (8th Ed.). Philadelphia: Wolters Kluwer/Lippincott Williams and Wilkins.

Rajasekar, S. P., Philominathan, P., & Chinnathambi, V., (2013). *Research Methodology*. arXiv: physics/0601009v3 [physics.gen-ph]

Rozen, W. M., & Ashton, M. W., (2012). The Venous Anatomy of the Abdominal Wall for Deep Inferior Epigastric Artery (DIEP) Flaps in Breast Reconstruction. *Gland Surgery, 1*(2), 92-110.

Seretis, K., (2021). Applying Art and Science in Lipoabdominoplasty: Technical and Safety Considerations. *Plastic and Aesthetic Research*, 8, 51. https://dx.doi.org/10.20517/2347-9264.2021.71

Seung-Jun, O., & Thaller, S. R., (2002). Refinements in Abdominoplasty. *Clinics in Plastic Surgery, 29*(1), 95-109.

Shermak, M. A., (2020). Abdominoplasty with Combined Surgery. *Clinics in Plastic Surgery, 47*(3), 365-377.

Spector, J. A., Levine, S. M., & Karp, N. S., (2006). Surgical Solutions to the Problem of Massive Weight Loss. *World Journal of Gastroenterology, 12*(41), 6602-6607.

Sugerman, H. J. et al., (1996). Greater Risk of Incisional Hernia with Morbidly Obese Than Steroid Dependent Patients and Low Recurrence with Prefascial Polypropylene Mesh. *American Journal of Surgery, 171*(1), 80-84.

Szuba, A., & Rockson, S. G., (1998). Lymphedema: Classification, Diagnosis and Therapy. *Vascular Medicine, 3*(2), 145-156.

Trus, T. L., Pope, G. D., & Finlayson, S. R., (2005). National Trends in Utilization and Outcomes of Bariatric Surgery. *Surgical Endoscopy, 19*(5), 616-620.

van der Sande, M. A. B., & Walraven, G. E. L. et al., (2001). Family History: An Opportunity for Early Interventions and Improved Control of Hypertension, Obesity and Diabetes. *Bulletin of the World Health Organization, 79*(4), 321-328.

Winicki, N. M. et al., (2022). Panniculus Morbidus Resection Complicated by Multiple Gastrointestinal Hernias: A Case Report. *Annals of Medicine and Surgery*, 80, 104177. doi: 10.1016/j.amsu.2022.104177

Xia, Y., Zhao, J., & Cao, D. S., (2019). Safety of Lipoabdominoplasty versus Abdominoplasty: A Systematic Review and Meta-Analysis. *Aesthetic Plastic Surgery, 43*(1), 167-174.