CASE REPORT

Panniculus morbidus: obesity-related abdominal wall lymphoedema

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SUMMARY

A 52-year-old female patient presented with a massive abdominal wall swelling that adversely affected her lifestyle. Imaging revealed significant subcutaneous oedema and the presence of grossly distended veins. Subsequently, she underwent a 'toilet' panniculectomy and abdominoplasty. We describe the surgical technique used to retract the lymphoedematous tissue facilitating excisional surgery, and discuss the pathophysiology of this condition and the possible contribution of venous obstruction to the development of subcutaneous oedema.

BACKGROUND

Lymphoedema of the abdominal wall (panniculus morbidus) is a rare entity, with only a few retrospective reviews of panniculectomies and their complications having been described. Panniculus morbidus is associated with obesity and is likely to become more common with increasing levels of obesity. In the UK, the prevalence of obesity has increased from 15% to 26% in the last 20 years.¹ Panniculus morbidus is thought to be caused by obstruction of lymphatic channels leading to the hypertrophy of skin and subcutaneous tissues. In this case, obstruction of the superficial veins of the anterior abdominal wall also appears to have contributed to the oedema.

CASE PRESENTATION

A 52-year-old British woman presented to the clinic with increasing swelling on the right side of her abdominal wall which had gradually developed over the preceding 5–6 years. The mass caused a significant reduction in her mobility and affected her day-to-day activities such that she had become housebound. She also had poor personal hygiene and an impaired quality of life. The patient had previous multiple admissions for repeated attacks of cellulitis in the skin overlying the lump, which necessitated treatment with intravenous antibiotics. Her medical history included non-insulin-dependent diabetes mellitus, hypertension and hypercholesterolaemia. There was no history of hepatic or renal failure or malignancy.

On examination, the patient weighed 177 kg (body mass index (BMI): 62.7) and the swelling extended below the level of her knees (figure 1). The overlying skin was erythematous, hyperpigmented and indurated, with evidence of peau d'orange inferiorly. The pannus felt tense on palpation and was irreducible.

INVESTIGATIONS

To determine the cause of the swelling and to exclude the possibility of an abdominal wall hernia or a liposarcoma, an abdominal-pelvis CT scan was performed. The scan revealed a large right-sided abdominal mass (30×30×50 cm) consisting of markedly oedematous adipose tissue with extensive thickening of the overlying skin (up to 2.7 cm in thickness). The adipose tissue was highly vascular with large veins draining into the right femoral vein and also into the subcutaneous veins of the anterior abdominal wall (figure 2A,B).

TREATMENT

At the time of presentation to the surgical clinic, the site, size and weight of the pannus precluded the possibility of treatment by manual lymphatic drainage or fitted compression/bandaging. A decision was made to perform a 'toilet' panniculectomy and an abdominoplasty of the contralateral side of the abdomen, under general anaesthesia with use of appropriate antibiotic prophylaxis. We foresaw that the main difficulty of excisional surgery would be retraction of the pannus (figure 3A). To facilitate retraction, the lymphoedematous tissue was elevated using 10 Lane's tissue holding forceps clipped to the skin and threaded onto a metal bar fixed securely to a patient hoist (figure 3B). Having excised the pannus and achieved haemostasis, the wound was closed over four Redivac drains (12-French). The weight of the resected pannus was 35 kg.

OUTCOME AND FOLLOW-UP

Redivac drains evacuated serous fluid over a period of 1 week; unfortunately this was not sufficient to prevent the later development of a postoperative seroma (2 L of serosanguineous fluid was aspirated from the subcutaneous layer via an 8-French pigtail drain 8 weeks after discharge from the hospital). Postoperatively the patient recovered well, and was discharged 9 days after surgery with a weight of 140 kg (BMI: 49.6), on prophylactic low-molecular-weight heparin. Mobility was encouraged post-operatively and wound hygiene was maintained; she was subsequently managed with complex decongestive physical therapy (CDP). The patient resumed a weight loss programme, and after aspiration of the seroma no further complications were reported.

Histological examination revealed a normal epidermis with diffuse dermal fibrosis and thickening extending partially into the subcutis. One

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Figure 1 Panniculus morbidus extending below the level of the knees. The postoperative result of the abdominoplasty demonstrated a significant reduction in the abdominal wall mass and therefore allowed an improvement in the patient's mobility and quality of life. Left = preoperatively; right = postoperatively.

piece of subcuticular tissue showed broad fibrosed septa, which were scattered with multinuclear giant cells. Distended vascular channels, most of which contained thin walls, were seen within the dermis surrounded by a sparse perivascular lymphocytic infiltrate. The presence of an excessive number of lymphovascular channels was confirmed by immunostaining with D2-40.

Figure 2 (A) Coronal and (B) sagittal CT images of the abdomen and pelvis revealed significant oedema and the presence of grossly distended veins, measuring up to 13 mm in diameter.

Figure 3 (A) During panniculectomy, 10 Lane's tissue holding forceps were used to connect the abdominal wall to a metal bar fixed to the patient hoist to facilitate removal of the lymphoedematous tissue. (B) The resected mass elevated from the abdominal wall weighing 35 kg.

An unusual feature in this case was the presence of elastosis and elastophagocytosis, and focal areas of fat necrosis.

DISCUSSION

Panniculus morbidus is characterised by an overhanging abdominal layer of subcutaneous fat that can become complicated by the appearance of lymphoedema.^{2,3} It is the end stage of abdominal obesity, and patients often develop a reduction in mobility and may eventually become completely bedbound, increasing the risk of mortality.

Morbid obesity (BMI ≥ 40) can cause an obstruction of lymphatic channels,⁴ which leads to a relative reduction in the drainage capacity of the lymphatic system.⁵ In this case, lymphatic obstruction did not appear to be the only factor causing panniculus morbidus; reflux and obstruction in the valveless superficial veins of the anterior abdominal wall also appeared to contribute to the oedema. Imaging demonstrated grossly enlarged superficial veins measuring up to 13 mm in diameter; the mean diameter of the superior inferior epigastric vein at its termination is normally 2.3 mm (ranging from 1.8 mm to 3.3 mm).⁶ Gravitational forces cause the accumulation of protein-rich interstitial fluid in the most dependent part of the swelling, and the weight of this fluid stretches the skin of the swelling so that it becomes even more dependent, further impairing lymphatic and venous drainage and further increasing the size of the abdominal swelling. Thus the normal equilibrium of Starling's forces is upset in a positive feedback system.

The accumulation of protein-rich fluid in the dermis and subcutaneous tissue results in non-pitting oedema; fibrosis eventually causes the cobblestone appearance of the epidermis,⁷ which becomes colonised with bacteria and fungi.⁸ If left untreated, it can cause ichthyosis and cellulitis. According to LaPlace's law, as the radius of the swelling increases, so will the tension in the wall of the swelling, and once the tension exceeds the mean arterial pressure ischaemic ulceration of the skin is likely to occur.

In this case, one of the main concerns was the delay in initiating appropriate therapy. The pannus developed gradually over a substantial period of time and the condition was largely managed by the patient herself. One can only surmise that the relative rarity of this condition caused her attending physicians to treat a symptom of this condition, namely the cellulitis, on repeated occasions rather than to treat the underlying cause. It may well be that intervention in the form of manual lymphatic drainage or compression garments at an earlier stage may have prevented the need for surgical intervention. More frequent follow-ups and advice on diet and exercise may also have contributed to an overall better outcome.

A number of studies have been published on the surgical removal of abdominal pannus after massive weight loss caused by bariatric surgery.^{9 10} In such circumstances, manipulation of a lax pannus is not problematic and the excessive skin is excised. In cases of panniculus morbidus complicated with lymphoedema, the weight of the pannus makes its manipulation very difficult. Assistants are unable to retract it for any length of time, so a number of methods of retraction have been previously described: using Steinmann pins² or external traction sutures, either held by the assistant¹¹ or fixed to an orthopaedic table.¹² We chose to connect the abdominal wall to an electric patient hoist using 10 Lane's tissue holding forceps threaded onto a metal bar. The height and position of the hoist and pannus could be easily changed during the operation. After suspending the pannus, the tissue was excised. Surgeons should be aware that venous congestion caused by the pannus increases the risk of significant blood loss. Part of the challenge associated with massive panniculectomy is getting skin closure with a minimum of dead space. To achieve this, undermining the skin edges is kept to a minimum and the fascia is closed with elliptical transverse plication.¹³ This surgery is associated with a high number of severe complications, including intraoperative bleeding, adipose tissue necrosis, seroma formation, abdominoplasty-related nerve damage, scar asymmetry, wound infection and dehiscence. These can lead to an increase in hospital stay and further readmissions, particularly as these patients are excessively obese and more susceptible to wound healing problems.

The panniculectomy we performed proved to be an effective surgical technique to increase the mobility of the patient and her quality of life. It improved the cosmetic appearance of her abdomen and allowed her to start a weight loss programme. As this case is associated with morbid obesity, the patient could eventually consider possible bariatric surgery after the panniculectomy.

The result of this operation was enhanced postoperatively by the addition of CDP, which may have been beneficial if it had been possible in the preoperative period. It has been suggested that preoperative CDP may reduce local tissue inflammation, oedema and infection rates in order to reduce postoperative complications.¹⁴ CDP involves daily manual lymphatic drainage, compression bandaging, exercise and education in lymphoedema self-management.⁴ Manual lymphatic drainage helps stimulate the contractility of the lymphatic system to remove the excess interstitial fluid,¹⁵ whereas compression bandaging aids the return of interstitial fluid.¹⁶ Therefore, CDP decreases the lymphatic accumulation, as well as promotes good skin and wound care. Additional management in a lymphological clinic during the postoperative period has been shown to reduce the rates and severity of complications associated with the resection of a panniculus morbidus.¹⁴ Diuretics have a limited role in the correction of lymphoedema; dieting alone does not reduce the mass of the abdominal pannus once it has already become established.

In summary, abdominal panniculus morbidus is a rare condition that is poorly described in the literature. There is a strong correlation between obesity and abdominal wall lymphoedema so its incidence is likely to increase in future. The pathophysiology of the condition is due to a reduction in the lymphatic and venous function of the anterior abdominal wall. This case illustrates that early diagnosis and treatment are essential to alleviate the morbidity and mortality risks associated with panniculus morbidus. The outcome of surgery may be improved by preoperative and postoperative CDP, with consideration of eventual bariatric surgery. Further investigation is needed to elucidate the

underlying mechanisms of panniculus morbidus and to reduce the postoperative complications (intraoperative bleeding, wound healing and seroma formation).

Patient's perspective

Before the operation, I found it difficult to move around and carry on with my day-to-day activities. Despite the adjustments made at home and work to help me overcome this, I had gradually become housebound and had a reduced quality of life. I could no longer use the public transport system or travel abroad. My husband and son supported me and helped me cope during this difficult period.

Two years after the operation, I was asked to provide feedback on the outcome of the panniculectomy and my current situation. I am very satisfied and pleased with the success of the operation and the fast recovery. Physically, I have no pain to report or any further episodes of cellulitis. My mobility has improved and I continue to attend rehabilitation exercise classes. I have also managed to maintain my weight after the operation and my diabetes and hypertension are both under control. Psychologically, I have regained my confidence and my mood has been lifted due to an improvement in my quality of life.

Learning points

- ▶ Consider a diagnosis of abdominal wall lymphoedema as a cause of recurrent episodes of abdominal wall cellulitis.
- ▶ A CT scan is useful in confirming lymphoedema and excluding other causes.
- ▶ The use of a hoist with a metal bar and Lane's tissue holding forceps to elevate and facilitate excision of the pannus.
- ▶ Although typically panniculus morbidus is associated with lymphatic dysfunction, one should also be aware of the venous component particularly if surgery is contemplated and blood loss is to be minimised.
- ▶ Panniculectomy followed by abdominoplasty can lead to a substantial improvement in patient satisfaction and quality of life.

Contributors MGF: data/image collection, interpretation of the data, discussing and analysing data, collecting patient's feedback and consent, writing of the paper. MC: planning and discussing the paper, interpretation of the data. CG: reporting and designing the paper, interpretation of the data. BA: performed the panniculectomy and abdominoplasty, planning and editing the paper, interpretation of the data.

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