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CASE REPORT: BREAST LIPOGRAFT – AN OPTION FOR THE SURGICAL TREATMENT OF POLAND SYNDROME IN LOW WEIGHT PATIENTS

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ABSTRACT

The popularity of autologous fat grafts has been growing in recent years in the world of plastic surgery due to their applicability with good results for both aesthetic and reparative purposes, such as in cases of asymmetries in Poland syndrome. We report the case of a low-weight patient with Poland syndrome, with improvement in breast asymmetry through sequential breast fat grafting, respecting an appropriate surgical technique. Three fat grafting sessions were performed with a total of 445ml, following Colerman's principles, with a percentage loss of 47.2% of the transferred tissue after 19 months of follow-up. Although the standard treatment of Poland syndrome in women is based on muscle flaps associated with breast implants, breast fat grafting has its role, not only in remodeling and refinement, but as a possibility for reconstruction, with sequential surgeries being an alternative for better survival. of the graft, with good functional and aesthetic results.

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INTRODUCTION

Autologous fat transfer is a widely employed procedure within the field of plastic surgery. Fat can be considered an ideal soft tissue filler due to its availability and compatibility with the host. This filler allows for tissue volume augmentation, contouring areas and defining shape without requiring implants, and an evolution with fewer long-term complications when comparing fat versus implants. With the growing popularity of lipografts, the technique has been gaining acceptance in breast surgeries, for both reconstructive and aesthetic purposes. The first description of the use of autologous fat as filler was in 1895 by Czerny, who performed a breast augmentation with the fat grafter from a lipoma in the back of the patient.

This technique became obsolete in the mid 1950s due to uncertainties about the eventual loss of volume of these grafts and other complications. Subsequently, being denounced by the American Society for Aesthetic Plastic Surgery in 1987. Thereafter, studies conducted in the 21st century show that the safety of the technique and the breast lipograft had gained significant popularity, sparking new-found interest in the international medical community[2]. Nowadays, it is recommended for small to moderate breast volume augmentations in the post oncological surgery context, including as an adjunct technique in reconstructions and refinements, for contour restoration in deformed breast areas, for aesthetic breast augmentation procedures, and for correcting congenital deformities such as tubular breasts and Poland syndrome. Poland syndrome is a rare congenital anomaly, approximately 1/30.000 live births, characterized by the

hypoplasia of the breast and nipple, scarcity of the subcutaneous tissue, absence of the colosternal portion of the pectoralis major muscle, absence of the pectoralis minor muscle, aplasia or deformity of the costal cartilages of the 2nd to 4th or 2nd to 5th ribs, axillary alopecia, and unilateral brachysyndactyly. The extent and involvement of these components are variables and it is rare to have all characteristics in the same individual. The treatment for adults with hypoplastic breasts is traditionally described using prosthetic implants or musculocutaneous flaps. Breast lipografting is currently an alternative for this syndrome as an adjunct and complementary method, earning good results in breast remodeling. As with any other fat grafting procedure, the skepticism about the unpredictability and low survival rate of the graft remains, especially in low-weight patients, on whom the surgical technique and results are more challenging. There is also the risk of complications, a possibility present in whatever surgical maneuvering of the breasts, such as fat necrosis, development of cysts and hardening, which may have relevant negative psychosocial impact on this population of patients who already bear deformities and possible childhood psychological trauma. The goal of this piece is to present autologous fat transfer as an alternative treatment for the correction of deformities in the chest wall, through reporting a case of a low-weight patient with Poland Syndrome and describing the surgical technique used.

CASE REPORT

Female patient, 18 years old, diagnosed with Poland Syndrome, with significant asymmetry of the breast and rib cage. Physical examination and prior chest CT scan revealed aplasia of the left pectoralis major and minor muscles, no agenesis of costal arches, left breast hypoplasia with skin adhered to the chest wall, and skeletonization of the costal arches in the left hemithorax, with limited mobility (Figure 1).

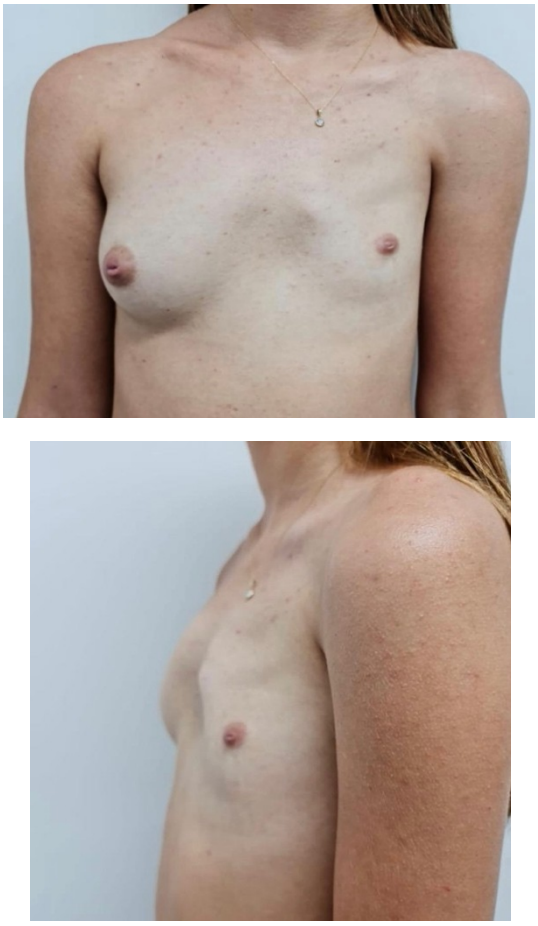
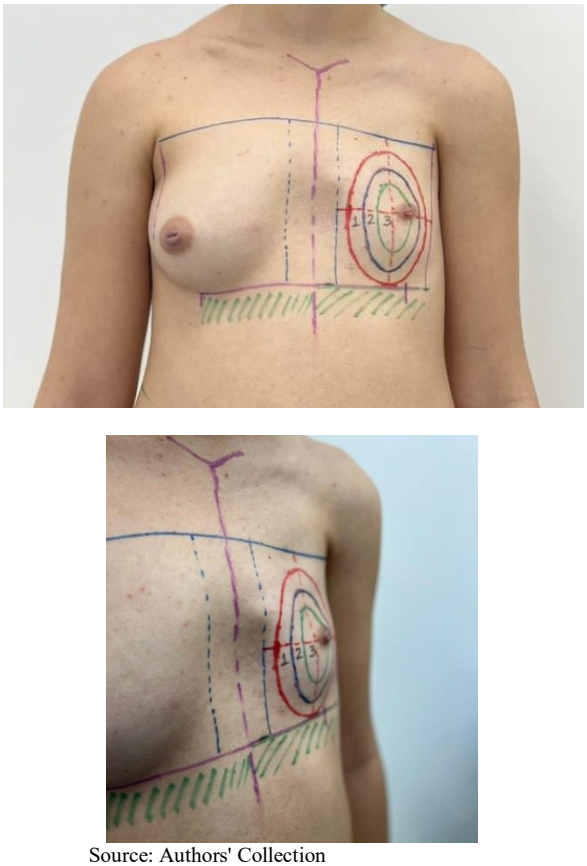


Figure 1. 18-year-old patient with Poland syndrome in pre-operative photographic record. Source: Authors' Collection

Weight: 49kg; Height: 1,72m (BMI 16,56). As a patient with muscular agenesis and lack of subcutaneous tissue, sequential local fat grafting was chosen as the treatment option. In October 2021, with a BMI of 17.91, after a hypercaloric diet was advised, liposuction of the abdomen and flanks were performed, along with the grafting of 152 ml of fat tissue into the left breast. Ten months later, a second surgical procedure was performed, including liposuction of the back, sacral promontory, and flanks, with the grafting of 125 ml of fat tissue into the left breast. The third and final surgical procedure was carried out five months later, following the positive results of the previous procedures, with liposuction of the abdomen and flanks and the grafting of 168 ml of fat into the left breast, to a total of 445 ml of fat grafted into the left breast.

***Surgical Technique**:* Sequential procedures were performed under general anesthesia, with prior marking of the areas for liposuction and fat grafting in the left breast. A 0.9% saline solution diluted with adrenaline 1:500,000 was infiltrated into the selected fat collection zones, followed by aspiration using a 4mm blunt-tip cannula connected to a liposuction machine set at pressures below 500mmHg. The collected material was split into 10 ml syringes and centrifuged at 2000 rpm for 2 minutes, following the principles of Collerman's technique. The lipoaspirate was separated into three phases: blood, oil, and purified adipose tissue, with the oil and blood being discarded. After transferring the purified fat to 3 ml syringes, the treated fat was injected through a small incision in the lower breast using microcannulas, in small amounts, in multiple directions and planes, respecting the topography of the breast, building from the base of the breast to the central region (Figure 2).



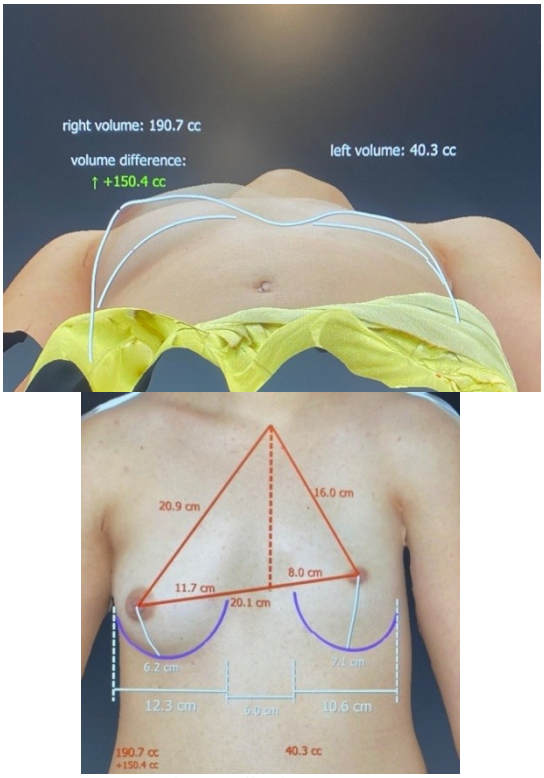
Source: Authors' Collection

Figure 2. Marking of the fat graft recipient area, with division into quadrants and sectors to ensure better fat distribution. Second surgical stage

RESULTS

Since the first approach, the procedures have been successful, with improved breast symmetry and better results after each sequence of fat grafting. There were no intra or postoperative complications; the

patient progressed clinically stable, with no functional losses. A simulation using a 3D software was performed after the first fat grafting session to better study the asymmetry and the volumetric difference between the breasts, and to plan the amount of fat tissue to be grafted in future sessions. The photographs were taken using a Canon EOS Rebel T3i camera attached to a Vectra imaging system (Canfield, NJ), which provided a three-dimensional (3D) image of the patient (Figure 3). A contrast-enhanced chest MRI was performed 4 months after the last fat grafting session, showing an approximate volume of 235 ml of fat tissue in the left breast, with an estimated 47.2% loss of transplanted adipose tissue (Figures 4, 5, and 6).

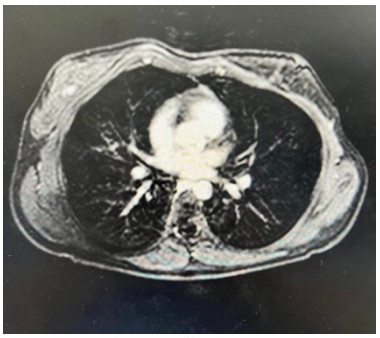


Source: Authors' Collection

Figure 3. 3D simulation of volumetry and size of the breasts 10 months after the first lipograft

Source: Authors' Collection

Figure 4. Photos comparing preoperative (left), after the second lipograft (center), and 4 months after the third lipograft (right), adding up to 19 months of monitoring.



Source: Authors' Collection

Figure 5. MRI on the 19th month post-operative, after the first surgical procedure, following three lipografts, with accentuated fat volume to the left, totaling approximately 235ml.

Source: Authors' Collection

Figure 6. Follow-up of the result 1 year after the last lipografting procedure, with improvement of the breast skin, definition of the inframammary fold, subclavian and anterior axillary filling, mimicking the Spencer's tail

DISCUSSION

In Poland syndrome, the involvement of the breast can range from mild hypoplasia to complete absence of breast tissue and is present in more than one-third of female patients, with the nipple and areola generally being hypoplastic. In the reported case, we presented a patient with breast and areolar hypoplasia on the left side. Surgical treatment should only be performed after puberty to allow for symmetry with a fully developed contralateral breast. Fat grafting to the breasts for the treatment of congenital deformities is already well-established, with the same challenges and complications as lipografting in other regions. When performed in low-weight patients (BMI < 18.5), as in the case of the patient in question, there are additional challenges[5]. The breast tissue pocket in these patients is limited, with tight overlying skin, which can increase the risk of graft loss if larger amounts of fat tissue are injected. Fat collection is also more difficult, sometimes requiring aspiration from two or more areas of the body, as was done in the sequential surgeries of the reported patient. Fat was aspirated from two sites alternately, including the anterior abdomen, flanks, and back, with a maximum aspirate volume of 700 ml to 800 ml per procedure. In patients with a BMI above normal, approximately 1,200 ml of fat aspirate is typically obtained.

Cheng-Hung Chiu divided patients seeking breast augmentation with fat grafting into two groups: Group A with BMI > 18.5 and Group B with BMI ≤ 18.5. In Group A, an average of 254 ml of fat tissue was grafted, while in Group B, an average of 241 ml (range: 110-300 ml) was grafted, with statistical significance, demonstrating that underweight patients receive smaller graft volumes. In the reported patient, with a BMI < 18, 152 ml was grafted safely during the first procedure, consistent with the literature. However, through sequential surgeries, a total of 445 ml of fat tissue was transplanted, achieving significant aesthetic improvement and satisfaction of the patient. In an effort to minimize loss of the fat graft and reduce postoperative complications, debates about ideal collection, processing, and injection methods are increasing. Strong et al's[7] systematic review highlighted lower graft loss rates with centrifugation as opposed to sedimentation, demonstrating that centrifugation speeds between 92 and 20,627 g are safe [RCF or G-Force = 1.12 x R x (RPM/1000)², where R is the rotor radius in millimeters], with varied values reported in the literature. Several studies use centrifugation at 3,000 rpm for 3 minutes with good results[11]. The technique used in the reported case was adapted and based on the principles described by Coleman and Saboeiro, in which treated fat is injected in small aliquots with each pass, increasing the contact surface between adipocytes and the host tissue capillaries, promoting nourishment and minimizing the likelihood of adipocyte necrosis. Injection in a "bolus" should not be performed, as it facilitates the formation of fat necrosis[10], and repeated "back-and-forth" movements can result in clumped grafts and failure of procedure.

Regarding fat tissue harvesting, various techniques can be employed, such as manual aspiration with a syringe, the most popular method among surgeons, conventional liposuction, and even direct excision of the tissue. Conventional liposuction using negative pressure can range from -300 to -760 mmHg and can be safely used for tissue collection, producing grafts with good viability and cellular density similar to those obtained via manual aspiration[8]. However, the use of high negative pressures can have detrimental effects, destroying up to 90% of adipocytes[9]. Despite advancements in surgical techniques, the survival rates of fat grafts remain unpredictable and inconsistent. The literature varies regarding the percentage of grafted fat tissue that is gradually lost. Recently, more sophisticated measurement methods, such as 3D imaging systems or Magnetic Resonance Imaging (MRI), have been used. MRI has the advantage of accurately identifying complications such as fat necrosis, as well as diagnosing calcifications in fat cysts, which can only be detected through this test[13]. An analysis of 8 studies involving a total of 523 patients, including 4 using magnetic resonance imaging (MRI), 3 using 3D systems, and 1 combining both methods, demonstrated a fat retention rate of 62.4% (range: 44.7–82.6%) for breast augmentation via lipograft, with an average follow-up period of 16.6 months[6]. The resorption rate of injected adipose tissue, typically around 30–40%, is lower after a second grafting session, averaging approximately 20–30%[12]. The fat resorption rate for the patient in the reported case was 47.2% over a total follow-up period of 19 months, consistent with findings in the literature.

Few studies in the literature have focused on exclusive fat grafting for the treatment of Poland syndrome in women, as this procedure is generally reserved for refinement or male patients[14-15]. Coudurier et al. (2015) reported the case of a 12-year-old patient with severe Poland syndrome who underwent five fat grafting sessions, with a total transfer of 809 ml of fat tissue between 2001 and 2003. The patient achieved a satisfactory result in terms of natural breast contour, preserved consistency, and sensitivity after 10 years of follow-up[18]. Derder et al. (2014) demonstrated that breast lipografting is considered complete when the breast is saturated and unable to receive more fat or when the desired aesthetic result is achieved. The study highlighted the advantages of this procedure over prosthetic implants, including a more natural breast appearance, improved skin quality and texture, and significantly reduced scarring. Specifically, in patients with Poland syndrome, fat grafting is particularly useful for filling the subclavicular cavity due to atrophy of the pectoralis major muscle[16]. In the case presented, both the care team and the patient expressed a desire to proceed with additional lipograft sessions to achieve the desired outcome, given the success of the initial three sessions. Other complications associated with autologous breast fat grafting include fat necrosis, infection, indurations, and calcifications. Complication rates are relatively high, ranging from 10-16%[5]. No complications were evidenced in the reported case.

CONCLUSION

Breast lipograft is a safe and effective treatment option for patients with Poland syndrome, including female patients with severe deformities and low body weight, through sequential procedures and careful surgical technique.

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