Review

Lipomodelling of the Breast: A review

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ABSTRACT

Background: Autologous fat transplantation has been used to correct cosmetic deformities in almost all areas of the body. In recent years, there has been a resurgence of interest in the use of fatty tissue to fill defects resulting from breast conserving surgery (BCS) and asymmetries after reconstructive breast surgery.

Methods: A Medline database search was performed, and the published evidence was reviewed.

Results & conclusion: We describe and discuss the technique and indications, advantages, disadvantages and future direction of fat transfer to the breast.

Search methodology: A Medline database search was used to retrieve relevant literature. Key search words used were: breast fat transfer, fat auto-transplantation, adipose tissue injection and lipomodelling. As a number of original articles are in French these were translated and used in addition to the English publications.

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Introduction

The first report of fat transplantation was in 1893 when Neuber transferred fat from the arm to correct a facial deformity.1 The procedure has been applied to almost every region in the body including limbs, breasts, buttocks and genitalia. Its popularity springs from the simplicity of the basic concept, technical ease, autologous nature and the possibility of altering the outcome by repeating the intervention.

Čzerny first described fat transplantation to the breast in 1895.2 He used a large lipoma to reconstruct a defect resulting from excision of a benign lesion. Lexer transferred fat to the face, and later to the breast.2 Bruning was the first to use a syringe to inject fat in 1911.3 Following the introduction of liposuction by Fischer in the mid 1970s, and the report by Illouz of more than 3000 cases of fat in 1911,1 following the introduction of liposuction by Fischer in the mid 1970s, and the report by Illouz of more than 3000 cases of liposuction, the concept of using the suctioned fat to correct defects elsewhere began to emerge.3 Illouz started injecting fat to correct contour deformities resulting from liposuction. He also introduced the idea that individual adipose cells survived by osmosis before the development of neovascularisation, as opposed to adipocytes within compact surgically excised adipose tissue. He compared this to a cell culture environment.4 A short revival in breast fat transplantation was initiated by Mel Bircoll in the early eighties, but was terminated after concerns over post-operative calcifications, and the risk of obscuring developing malignant lesions.5

Fournier introduced the term “liposculpture” as his own version of the technique. He claimed to be the first to use a needle for aspiration in 1985, and to obtain good results in facial and breast transplants.6 However, the recent re-emerging popularity of breast fat transplantation is based on recent reports and work by a number of surgeons including Coleman and Delay, who have introduced the term “lipomodelling”, and used the technique alone, or in combination with other reconstructive procedures.

Technique

The steps in the process of lipomodelling are: identification of donor sites, harvesting, preparation, and injection of the fat. The overall aim is to minimize adipocyte damage and promote survival. Lipomodelling can be a lengthy operation, which constitutes a major limiting factor. Coleman reported an average of 2 h for the first 100 ml injected, and 45 min for any additional 100 ml.7 Others, employing the same technique, reported an average procedure time of 115 min (range 60–165 min) for an average injection volume of 144 ml in each breast.8

General anaesthetic is usually used; however local anaesthesia can be used in smaller procedures.9 The lower abdomen, back, trochanteric region, thighs and medial aspect of the knee are all possible donor sites. The first is preferable as it provides a single
operative field. The thigh region contains less septae and has a relatively low blood supply, and is therefore less susceptible to postoperative collections. The choice of donor sites has not been shown to affect the survival of the adipocytes.

Harvesting is a major contributory factor to the success of lipomodelling. Open excision of fat has now been replaced by liposuction and syringe lipoaspiration. Studies comparing the latter two techniques have found no significant difference in the population of viable adipocytes obtained. In either technique, the use of low negative pressure is recommended. Although both techniques can disrupt the lobular architecture of adipose tissue, suction aspiration has in addition, been shown to cause cellular alteration and dehydration, secondary to cellular fluid evaporation.

Animal studies have reported 90% destruction of liposuctioned adipocytes, compared with 5% in the aspirated fat. Pulling the plunger of a 10 ml syringe can generate an average pressure equal to 40% that generated by liposuction. It can however, reach 100% on maximal withdrawal.

The wet harvesting technique involves injection of a dilute mixture of local anaesthetic and adrenaline into the donor site before liposuction, to decrease postoperative bleeding and provide anaesthesia. Normal saline, or Ringer’s solution, can be used for dilution. Adding hyaluronidase was claimed to facilitate harvesting by “softening” the fat. Hörö used a similar mixture, and observed that the use of hyaluronidase resulted in a 50% increase in adipocyte viability. Advocates of the dry technique have suggested that large amounts of infiltrate could affect cellular adhesion properties.

Fournier published his 15-year experience with facial and trunk (including breasts) fat transfer and suggested a number of different concepts to improve fat survival. He described aspiration with a syringe containing 2 ml of fluid to decrease adipocyte damage by lowering the impact against the syringe walls. He also prepared the donor sites days preceding surgery to induce an inflammatory reaction, and increase graft survival.

Culture media rich in growth hormones have been used to support the cells preceding neovascularisation, through providing nutrition and creating intercellular spaces.

Centrifugation of the harvested fat separates the adipocytes from diluting fluid, local anaesthetic, blood and other cellular debris. This decreases the risk of eliciting an inflammatory response at the recipient site. An inverse relationship has been observed between the amount of blood in the lipoaspirate and the number of viable adipocytes. Centrifugation is performed at a speed of 3000–3500 rpm for 3–4 min. Speed as low as 1000 rpm has been previously used. No significant differences were detected in adipocyte survival with or without centrifugation. Different durations of centrifugation (2–8 min), had no effect on the number of viable cells in the lipoaspirate.

Centrifugation yields three layers (Fig. 1) with ruptured adipocytes, triglycerides and chylomicrons forming the top layer, puriﬁed fat for injection of the harvested fat separating the adipocytes and a mixture of ﬂuid, blood and cellular debris at the bottom. Washing the lipoaspirate with different solutions such as Ringer’s, normal saline, or 5% dextrose, has been used to achieve the same effect.

Some prefer avoiding all preparation techniques. Smith et al. have used a specific metabolic cell viability assay to demonstrate better survival rates with unprepared samples as compared to washed or centrifuged samples.

Fat is injected in small amounts as the needle is gradually withdrawn. Small pulses ensure that a maximum number of adipocytes are in close proximity to the recipient tissue and therefore to an established source of blood supply. Creating layers of grafted tissue aids initial survival and vascularisation.

Fig. 1. Products of centrifugation. Centrifugation of the lipoaspirate yields three layers, with the puriﬁed fat forming the central layer.

**Volume loss after lipomodelling**

A degree of fat resorption occurs in almost all cases of lipomodelling, constitutes a major disadvantage, and may necessitate repeating the procedure.

Experimental studies have found that up to 90% of transplanted adipose tissue could be lost, while clinically reported figures range between 40 and 60%. Most of the volume loss occurs within the first 4–6 months following surgery.

Histological examination of the fat graft within the first few weeks has revealed macrophages, lymphocytes, ﬁbroblasts and giant cells, in addition to lipid cysts and necrotic tissue. Suctioned fat has shown more of these changes than aspirated or excised fat. Months later, more ﬁbrous tissue and less viable fat cells were evident. Improvements in shape and contour can be preserved through ﬁbrous tissue, even in the absence of viable adipocytes.

On the other hand, biopsies obtained up to 3 years after facial transfer have revealed viable adipocytes in a well deﬁned vascular lobular structure, and no evidence of ﬁbrosis. Cellular disruption secondary to mechanical stresses, lipid induced membrane damage, development of an inflammatory reaction, and increase graft survival.

Injecting large volumes of fat could cause contour irregularities and subcutaneous inﬁltration improves the contour, while intra-parenchymal injection can enhance the projection of the breast.

Coleman and Delay have described in detail their technique of fat injection. Small skin incisions are made with a scalpel or a trocar and blunt cannulae 1–2 mm in diameter are used to inject the fat, avoiding vascular damage and intravascular injections. A pistol device, which delivers constant pulses of 0.5–1 ml of fat, had been previously used. The maximum recommended pulse varied from 0.2 ml to 0.25 ml to 5 ml. Injecting large volumes of fat could cause contour irregularities and jeopardize the vascularity of the graft; injections of more than 1.5 ml can result in fat necrosis. It is important to recognize tissue tension, and plan a repeat session instead.

The volume of injected fat varies depending on the size and surface area of the defect. In a study of 17 patients with different deformities, between 70 and 460 ml of fat were injected. Missana used an average of 144 ml per breast following latissimus dorsi (LD) reconstructions and transverse rectus abdominis (TRAM) ﬂaps, and an average of 75 ml in breasts following breast conserving surgery.
and liponecrotic cysts were common, but easily identifiable. Although large emphasis is placed on studies of MRI, a combination of US and mammograms could be sufficient for the postoperative follow up of lipomodelling patients.  

MRI can easily differentiate between normal breast fat, fat necrosis and early recurrences. However, the distinction between existing and injected fat can be much more difficult. Postoperative interval images up to 12 months could accurately detect changes of 1.2–3.2 ml, with a difference of less than 5% when compared with the injected volumes. T-mode ultrasound has been successful in measuring the thickness of tissue between pectoralis major and the skin surface, as representative of volume gain and loss. CT has also been used before for volume assessment, however its use is limited by the radiation dose involved.

Indications for lipomodelling of the breast

Lipomodelling has been used as the sole reconstructive procedure in congenital abnormalities, in conjunction with LD and TRAM flap reconstruction, to correct defects resulting from breast conserving surgery and to improve appearance after implant reconstruction (Table 1).

Six patients diagnosed with Poland’s syndrome were successfully managed using lipomodelling. Subcutaneous fat transfer has produced a more natural look than prosthesis implants in a patient with tuberous breasts; however, multiple sessions were required to achieve the same effect.

In a report of 200 cases of breast reconstruction, 22% of patients underwent multiple sessions of lipomodelling. Intramuscular injections up to 470 ml per breast were possible. Previous experimental studies have shown muscle to be an excellent provider of blood supply. Lipomodelling has been used in 42 patients following BCS. After an average follow up of 20 months, patient satisfaction was >90% and surgeons assessment of the outcome was good or very good in >90% of cases. Deformities following breast implants such as skin rippling, positioning and capsular contractures can be difficult to correct, and may necessitate implant replacement. Coleman et al used lipomodelling to treat two post-implant deformities. Subcutaneous transfer increased coverage, thereby improving the feel and the appearance of the breasts. In one patient, there was an improvement from a Baker grade III contracture to a Baker grade I. Delay recommended intrapectoral injections into the upper and medial parts of the implant-reconstructed breasts and subcutaneously into the lateral aspect to obtain the best cosmetic outcome. Fat has also been used to improve the cleavage through obscuring a prominent sternum.

Spear, reported a 10 year experience of 43 breasts treated with lipomodelling following implant reconstruction and autologous flap reconstruction (TRAM or LD). Substantial cosmetic improvement was reported in 21% of patients, moderate in 64% and no improvement in 15%.

A pilot study by Rigotti et al. examined the transfer of stem cells into 20 patients with radiotherapy damaged tissues (post mastectomy with or without a prosthesis, and post quadrantectomy). At a mean follow up of 30 months (18–33 months), 19 out of 20 patients experienced a statistically significant decrease in LENT-SOMA (Late Effects Normal Tissue-Subjective, Objective, Management and Analytic) scores. This study included one patient with skin necrosis and osteoradionecrosis with rib exposure, in whom fat transfer resulted in the formation of granulation tissue that was subsequently covered by a skin graft.

Fig. 2. Fat injection. A schematic representation of the multiple layers of fat injections. Creating layers of adipose tissue can increase the graft survival and decrease the rate of fat resorption.

reaction to the transplanted fat and insufficient vascularisation, have all been implicated in contributing to fat resorption. In addition, less well understood genetic and environmental factors might also have a role. It has been suggested that small, dense adipocytes in lean individuals will maintain more of their volume, and therefore the graft volume, than larger cells of the obese. Delay, in his recent work, proposed the “twice 30% rule”; 30% of the harvested volume is lost during centrifugation and preparation and 30% during the first 4 months after surgery due to resorption. Injecting 150% of the desired volume would allow for resorption. 15–22% of previous lipomodelling patients required a repeat procedure because of volume resorption.

Post lipomodelling imaging

Postoperative imaging detects signs of new or recurrent malignancy, and can estimate volume changes. Combined ultrasound, mammography and magnetic resonance imaging (MRI) used to assess patients following LD flap reconstruction and lipomodelling, have detected changes that were easily identifiable as either benign or suspicious; microcalcifications, macrocalcifications, simple and complex cysts, and solid masses. The above three imaging modalities were also used in assessing patients following BCS and lipomodelling. 20% of the patients had evidence of benign microcalcifications before lipomodelling, and a similar percentage of patients after the procedure. Complex cysts
A recently published case series of 21 patients treated with stem cell fat transfer following breast conserving surgery and irradiation showed 79% patient satisfaction and significant volume improvement as measured by t-mode ultrasound.30

A series of 23 patients who received lipomodelling for the management of ptotic breasts has been reported. To our knowledge, this is the only study including this group of patients. The cosmetic outcome was unsatisfactory in 43.5% as judged by the patients and by an independent panel of surgeons.33

Complications

Oedema and bruising of both donor and recipient sites are common, and can be reduced by abdominal compression garments.3,7,9 Superficial infections in donor and recipient sites have been reported, but with no residual effects.3,21 Other complications include donor site contour irregularities and hypersensitivity.9

Transferred adipocytes were shown to possess a certain degree of memory, and therefore emphasis should be placed on maintaining an ideal and constant weight at the time of surgery and afterwards.3,14 Patients, who had received fat transplants to the cheeks, and gained weight during the first year, reported a disproportional gain at the recipient sites compared to other body areas.10 One patient had to undergo cheek liposuction to improve the cosmetic outcome.

One case of intraoperative pneumothorax was caused by the transfer cannula.9 Palpable liponecrotic cysts,21 and a cheek granuloma,10 required surgical excision.

Oncological safety of lipomodelling

Bircoll presented his technique of autologous fat transplantation for breast augmentation in 1984.5 The American Society of Plastic & Reconstructive Surgery denounced the procedure arguing that postoperative calcifications and fat necrosis could mask the early radiological signs and delay the diagnosis of breast cancer (ASPRS committee on New Procedures Report; 1987). Fat necrosis can occur following almost any surgical procedure to the breast, and following interventions such as biopsy, or even spontaneously. It can manifest, and is readily identifiable radiologically in many different ways, including benign calcifications, lipid cysts, or more suspiciously as a focal or a spiculate mass.34 It is believed that the incidence of fat necrosis can be decreased by improvement in the surgeons’ technique and with more experience.28

In a recent report of 17 patients who had normal pre-lipomodelling mammograms, 14 had a postoperative mammogram and of these, two were diagnosed with breast cancer.7 One had reportedly developed cancer in an injection area, while the second in an unrelated area. In a series of 42 patients who had BCS, and after an average follow up of 20 months, there was one case of local recurrence (2.4%), in addition to three cases of contralateral breast cancer and one case of distant metastasis.28

The development of breast cancer after lipomodelling has not been extensively investigated. Zhu et al., in their recent experimental study, have injected a combination of adipose tissue, adipose derived stem cells and tumour cells (MCF-7 and MDA-MB-231) into mice and found no significant increase in tumour growth in the specimen harvested at 8 weeks.35

Recent advances in lipomodelling

Adipose derived stem cells (ADSCs) are easier to obtain and are considerably more abundant in lipoaspirate than marrow derived stem cells are in bone marrow aspirate.36 They are capable of self renewal and multilineage differentiation. ADSCs possess angiogenic and antiapoptotic properties that are independent of the differentiating potential. They secrete significant amounts of VEGF...
(vascular endothelial growth factor), HGF (hepatocyte growth factor) and TGF-β (transforming growth factor-β). 37

ADSCs have been previously transferred to radiotherapy damaged tissue. 33 They were obtained from the lipoaspirate, cultured and identified using monoclonal antibodies. Pre-treatment electron microscopy on the radiotherapy damaged tissue demonstrated fibrosis and microangiopathy. This was repeated at 1, 2, 6 and 12 months after the procedure, at which point there was evidence of abundant mature adipocytes and good microcirculation.

Co-transplantation of adipose tissue and ADSCs can provide the necessary stimuli for adipogenic differentiation. An in vivo experimental study that compared co-transplantation with adipocyte injection alone has shown a significant improvement in survival time, volume and quality of the grafted fat. Fat was injected subcutaneously into mice skulls, and assessed six and nine months later by weighing and by histological examination. 35

Co-transplantation has been used in a clinical setting to correct deformities resulting from breast conserving therapy in 21 patients. There was a significant improvement in tissue thickness (as measured by ultrasound scanning) and a 100% patient satisfaction at six months follow up. 36

The ADSC is currently the subject of the RESTORE-2 study: a multicentre European clinical trial utilizing ADSCs to treat complications and deformities following breast surgery. 38 This study exploits a bedside device which separates and concentrates ADSCs before they are re-injected into the patient. 39

**Discussion**

The psychological impact of surgery in breast cancer patients is multi-factorial; the cosmetic result and body image being as important as the fear of cancer recurrence. Better cosmetic result usually produces a better psychological outcome. 40,41 Some studies have demonstrated a better cosmetic outcome and satisfaction following reconstruction than BCS, 42 while others have suggested the opposite. 33,42 Despite its conservative nature, earlier studies have failed to show significant psychological and sexual benefits of BCS over mastectomy. 45–47 It is therefore important to realize that the effects of surgery and the perception of the outcome vary widely between individual patients. Reconstruction following deformities resulting from BCS can be very challenging, especially following adjuvant irradiation damage, and sometimes contralateral symmetry surgery may be the only option. Lipomodelling offers a fresh and promising cosmetic solution to these patients. However, the most important consideration remains patient safety. With this in mind, and the above presented evidence, the challenges associated with lipomodelling can be discussed as follows.

**Cosmetic results, volume replacement and resorption**

Absence of an autoimmune response, easy accessibility of donor fat, minimal complications and good cosmetic results make lipomodelling a virtually perfect procedure for the management of congenital anomalies and other defects not associated with previous malignancy. Disappointing results were reported in mammary ptosis. 33 Lipomodelling can be used for augmentation following mastectomy; however, it is unlikely to be suitable as a sole intervention in the management of ptosis. Congenital defects such as Poland’s syndrome, micromastia and asymmetry provide the surgeon with the ideal recipient tissue (no fibrosis or irradiation damage). Larger required volumes in these cases, coupled with the invariable risk of volume resorption pose surgical challenges. These can be addressed through:

(a) Replacing the lost volume. Repeated procedures have proven effective and well tolerated by the patients. Administration of small volumes with intervals of 4–5 months can significantly increase the volume deficits which can be managed with lipomodelling. Intervals of a few months are necessary to allow inter-procedural healing and the maximum volume resorption to occur before an assessment can be made and further sessions planned. Several studies have examined the potential of freezing fat grafts. 48–50 however, different temperatures, durations and techniques of freezing, and of analyzing the adipocyte viability have been used. Comparison is therefore difficult, and a consensus remains to be reached.

(b) Research into the natural history of volume resorption. This is the main limiting factor in lipomodelling, and counteracting the phenomenon of adipose tissue loss can enhance patients’ experiences while achieving the same if not a better cosmetic result. Surviving the initial transfer has been addressed through perfecting and standardizing the techniques of aspiration, preparation and injection. The basic principles remain; minimal trauma, low aspiration pressures and small pulses of injections. The standardized procedure proposed by Delay and Coleman satisfies these criteria, has produced consistent results and is to be commended. Second, the graft needs to survive on the longer term. Reports of viability studies, performed months after the transfer, show considerable variation from no or some detected adipocytes to normal adipose tissue. 10,15,26 The responsible factors herein are less well studied. Core implicated factors are cellular death following inflammatory conditions (inflammatory cells have been demonstrated in the vicinity of a fat graft within the first few weeks) and the lack of blood supply and nutrition preceding angiogenesis. 16 Other factors include genetic makeup, disease states, nutritional status and the ability to mount an inflammatory response or trigger angiogenesis.

More histological and molecular based studies are needed to address the contributing factors and how the loss varies between individual patients. Supplementing the graft with materials to enhance its survival has been studied. Selective β-blockers with their lipogenic/antilipolytic properties were shown to maintain graft volumes. 53 Similar results were obtained with fibroblast growth factor in animal models. 54 Insulin, and insulin-like growth factor. 55

It would be interesting to see whether a targeted introduction of nutrients during the pre-angiogenesis period would enhance survival. Another potential area to be explored would be the inflammatory response, which may well continue, possibly at a lower grade, towards the final hours of resorption. However, directly inhibiting inflammation would incur detrimental effects on the process of angiogenesis.

Volume, and thus cosmetic benefit, can be achieved through the formation of fibrous tissue and cystic structures. 16 However, a satisfactory outcome should be defined in terms of viable fat. Viable transplanted fat coupled with the regeneration of adipocytes from stem cells could explain the anecdotaly reported improvement in consistency and suppleness of irradiated breast tissue. The role of ADSCs in regeneration of damaged and excised tissue is a relatively new concept. Areas of interest include breast reconstruction and regeneration of cardiac myocytes following myocardial infarction. Following ADSC transplantation, invivo studies on rat myocardia have shown tissue consisting mainly of new blood vessels, undifferentiated stem cells, with few cardiomyocytes. 56 Similar invivo animal studies have histologically demonstrated regenerated adipocytes. 57 Ascertainning the differential representation of originally existing, transplanted, and regenerated adipocytes...
within a graft sample would be a reasonable first step towards understanding cellular behaviour and interactions. This can lead to identifying methods of enhancing the regenerative potential of ADSCs.

Cancer recurrence

The risk of cancer development or cancer recurrence has not been addressed in the recent clinical studies that included patients with BCS, and mastectomy and reconstruction. Data of pathology characteristics, and adjuvant treatment was not presented. It is important to consider this for a realistic risk assessment to be drawn against the actual recurrences. In previously published series, two patients with no history of breast cancer were diagnosed post lipomodelling. In another series of 42 patients with BCS, one patient developed local recurrence within an average follow-up of 20 months. The numbers are too small and the follow up periods too short to draw any valid conclusions.

The theory behind breast cancer recurring following lipomodelling is based on introducing a transplanted graft capable of encouraging angiogenesis into a tissue bed that might harbour cancer cells. These could be residual cells following the original surgery or other microscopic foci of invasive or in situ disease. A new primary is also a possibility especially in those younger women with a history of previous breast cancer who are known to be at higher risk. There are also no data on the effect of lipomodelling on those at genetic risk of breast cancer.

Breast cancer can recur years or even decades after the original treatment. In relation to breast cancer, the concept of dormancy has been studied in circulating tumour cells, in dormant cancer cells in the bone marrow years after completing adjuvant treatment, and in local recurrences following mastectomy. Dormant cells can be single cells in a state of cell cycle arrest or, micrometastases in a state of balanced apoptosis and proliferation. Both can be transformed into active metastasis by autocrine and paracrine inhibitory and growth stimulating factors. Inability to trigger neovascularization can be an important factor in maintaining dormancy, with VEGF having a specific role in the initial tumour growth, and other angiogenic factors being able to maintain growth after attaining a certain size.

Adipocytes, the most abundant type of stromal cells surrounding breast cancer, have been studied in relation to their role in controlling the tumour microenvironment, with emerging evidence of their tumorigenic potential — proliferation, invasiveness, survival and angiogenesis — through the secretion of adipokines. Mesenchymal stem cells exist within adipose tissue. ADSC have paracrine effects secreting adipokines; VEGF, HGF, Insulin like GF-1, which have two principle effects; angiogenesis — VEGF, HGF and bFGF, and antiapoptosis — IGF-1 and VEGF. Angiogenesis also occurs through differentiation of stem cells into endothelial cells.

ADSCs have also shown the ability to spontaneously transform and acquire malignant characteristics following a period of prolonged in vitro culture (4–5 months). This has not been demonstrated in clinical trials, or following the standard culture period of 6–8 weeks.

In view of the above, we think that a greater understanding of the biological characteristics of the adipocyte and ADSC are wanted before safety conclusions can be drawn.

Postoperative radiological abnormalities

These constituted the main reason why lipomodelling suffered a set back in the early 1980s, and have therefore been sufficiently addressed in the majority of the clinical studies to date. The associated abnormalities as evident on mammography, ultrasound and MRI are well defined, seen in other breast conditions, and should be dealt with according to the level of suspicion; either left alone if deemed benign or biopsied should a histological diagnosis be sought. The reported incidence of asymmetrical densities and parenchymal calcifications following reduction mammoplasty (one of the most performed procedures in breast surgery) is around 50% and that of fat necrosis is 10%. We think that with the current level of expertise in performing breast imaging, post-operative radiological lesions are surmountable difficulties that should not deter from lipomodelling. More thought and research is needed to address the issue of visualizing transplanted fat and its delineation from existing breast fat as this would aid in understanding resorption and fat loss. We also need to establish a standard regime of radiological preoperative assessment and postoperative follow up. Preoperatively, the aim is to detect radiologically visible cancers, and to obtain a base line image against which comparisons can be made. Would U/S and mammogram suffice, or would MRI be required even in the less dense breasts? Would preoperative imaging with no clinical indication raise the issues of increased false negative results, biopsies, and delays in surgery? There is currently no published evidence-based answer to these questions. Until longer-term follow up results are obtained, imaging is indicated preoperatively and at regular intervals postoperatively. MRI appears to be the most sensitive method of assessing the post lipomodelling breast but as with the normal postoperative breast, it would not be unreasonable to perform U/S and mammograms, with MRI added should a clinical indication arise.

Conclusion

Whilst the prospect of autologous breast reconstruction without relying on either pedicled or free flap transfer has obvious potential advantages further larger prospective studies are required. Following the procedure there is a need to determine the incidence of primary and recurrent breast cancer and the ideal method for screening for any malignancy.

The role of ADSCs has yet to be determined and currently there is a growing interest to determine the best way to store/freeze adipose tissue in order to facilitate a repeat outpatient procedure without further liposuction perhaps months or years after the original harvesting.

However, the effects of the injection of stem cells into a cancer bed needs to be rigorously investigated in both the molecular and clinical arenas. As reconstruction has evolved to the stage where we are now interacting directly with the patients own remaining breast tissue rather than just replacing it we need to base these techniques on knowledge gained from the laboratory and long term clinical follow up rather than relying on the presentation of photographs and small case series with little follow up. The pioneers like Delay and Coleman have developed this technique into a relatively simple and easy to learn procedure and it is rapidly gaining popularity amongst both patients and clinicians. We would suggest that whilst the technique should be made available for the patients to choose it would be as well to remember the “onco…” part of oncoplastic surgery and admit to the patients what we don’t know for certain about the long term effects whilst designing the studies to give us the answers.

Conflict of interest statement

No conflict of interest.

Ethical approval

No ethical approval was required.

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References


