Fat Grafting

Introduction

Human fat is a very important organ and contrary to public opinion it serves extremely important functions. Primarily it is one of the support structures that add to human shape and form, also acting as an insulation against cold. Fat is a lipid nutrition supply and may be metabolically converted to a source of carbohydrate energy. Fat also provides a store for vitamins, trace elements and even heavy metal and other toxins. Secondary sex characteristics involve different distribution of fat stores between the sexes and even at times of moderate weight loss, fat is selectively mobilized or preserved according to sex or genetic predisposition. Fat is a buffer to injury, a support to vital structures such as the eye and assists as a conduit for vital structures such as veins, lymphatics and nerves. In the latter is also acts as a nerve impulse conduit and is vital in repair and regeneration of injured nerves. In babies, fat fills the buccal pads and is vital for oral continence and especially breast feeding. It even acts as a policeman in the abdomen to protect against inflammation or perforation by plugging and isolating offending viscous. More recently fat has been shown to be a rich source of stem cells, capable of assisting in tissue regeneration. Fat stem cells also have a surprising ability to improve scar and pigmentation problems.

Harvesting Fat Graft

Fat grafting has been available for well over 40 years but was initially harvested as a composite of tissues that included structure such as de-epithelised skin. This was very useful to fill in large contour defects such as after mastectomy or in patients with hemi-facial atrophy. This was before the use of synthetic materials and involved tissues from the same or other animal species. From this, Medawar and others started to understand the genetic and immunological basis of tissue rejection. Whilst genetically modified allograft or immunosuppression can reduce rejection of allograft the risks of iatrogenic problems is considered too high for use in cosmetic surgery patients. Even though autologous composites are not rejected they still involve a donor site and because the tissue is a graft, it is without a blood supply and the fat often calcifies and goes hard. Clearly this is not satisfactory, particularly in breast reconstruction if there is suspicion of cancer.
About 35 years ago Fournier and Ilouz were harvesting fat using needle aspiration and transferring, safely via needles, to other areas of the body. Coleman advanced this technique further and we now think that stem cell rich aspirates have proportionately more chance of surviving the transfer. Rigotti further advanced the technique to use needles to release scars before filling the resultant defect with fat. Negative pressure delivery systems, such as the Brava, have also been shown to improve the proportion of fat that can survive transfer. Nowadays autologous fat grafting is common place and is an integral part of many procedures.

Sites of Fat Graft Harvest

This is dependent upon the volume of fat required and the site for transfer. Large volumes are best harvested from the abdomen, hips or flanks. Good volumes can also be available from thighs, knees, ankles and posterior arms. A good source of smaller volumes is from the neck and chin areas. In principle the smaller the volume harvested, the less donor defect and the less need for symmetrisation. Fat graft harvest areas should be selected as available for possible re-harvest for a secondary procedure and not really considered as a primary liposculpture or liposuction area. However patients often gain cosmetic contour improvement at donor sites.

Survival of Fat Graft

Fat is usually harvested from a donor site pre-loaded with fluid, to improve the quality of aspirate and negate a traumatic harvest. For small volume aspirates, as are required in facial re-volumisation, fat is harvested using syringes. The aspirate is composed of living intact fat-adipocytes, partially injured and totally disrupted fat cells. Some pre-loading fluid, fatty oil, blood and cellular material are also in the syringe.
The syringe is allowed to stand and the contents separate out into layers with the middle 3/5 of the column being richest in stem cells. Some Surgeons prefer to speed up the separation by centrifuging the syringes. Often there are fibrous strands within the aspirate and these are the structure onto which cells adhere.
Large volume aspirates, used for example in breast or buttock augmentation either require larger cannulae and syringes or preferably involve using mechanical harvesters and filters such as the Aquavage system. Larger syringes are used for the bigger volume fat transfers.
Once transferred, using a surgically planned and patterned planting method rather than simply depositing fat graft as a large bulk, the surrounding tissues will swell for a few days and thereafter regress. At 6 months about 60% of the grafted volume remains and thereafter some stem cells may help re-volumise to give an end result of up to 80% fat survival at one year. If the stem cells don't convert to adipocytes a varying volume may persist down to less than 10 percent. It is likely that the fat graft procedure may need repeating. This is more likely in individuals with a very thin adipose layer at the outset and it is advisable to advise that repeated procedures will be required at the original consultation. For those that also put on weight after surgery, the fat graft may well increase the general bulk and be unwanted. This is particularly important in face fat grafts. It is therefore best to fat graft in those who maintain a stable healthy BMI.

Fat Graft to Cheeks:
Pre- & Post-Op

Fat Graft to Breasts
Pre- & Post-Op

Fat Graft to Buttocks
Pre- & Post-Op

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