FAT GRAFTS

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BY

SORAYA REFAAT TERZAKI

Consultant Plastic and Reconstructive Surgery

Mataria Teaching Hospital

Minstry of Health

SUPERVISED BY

PROF. DR. HASSAN ADEL BADRAN

PROFESSOR AND HEAD OF THE UNIT OF

PLASTIC AND RECONSTRUCTIVE SURGERY

FACULTY OF MEDICINE

AIN SHAMS UNIVERSITY

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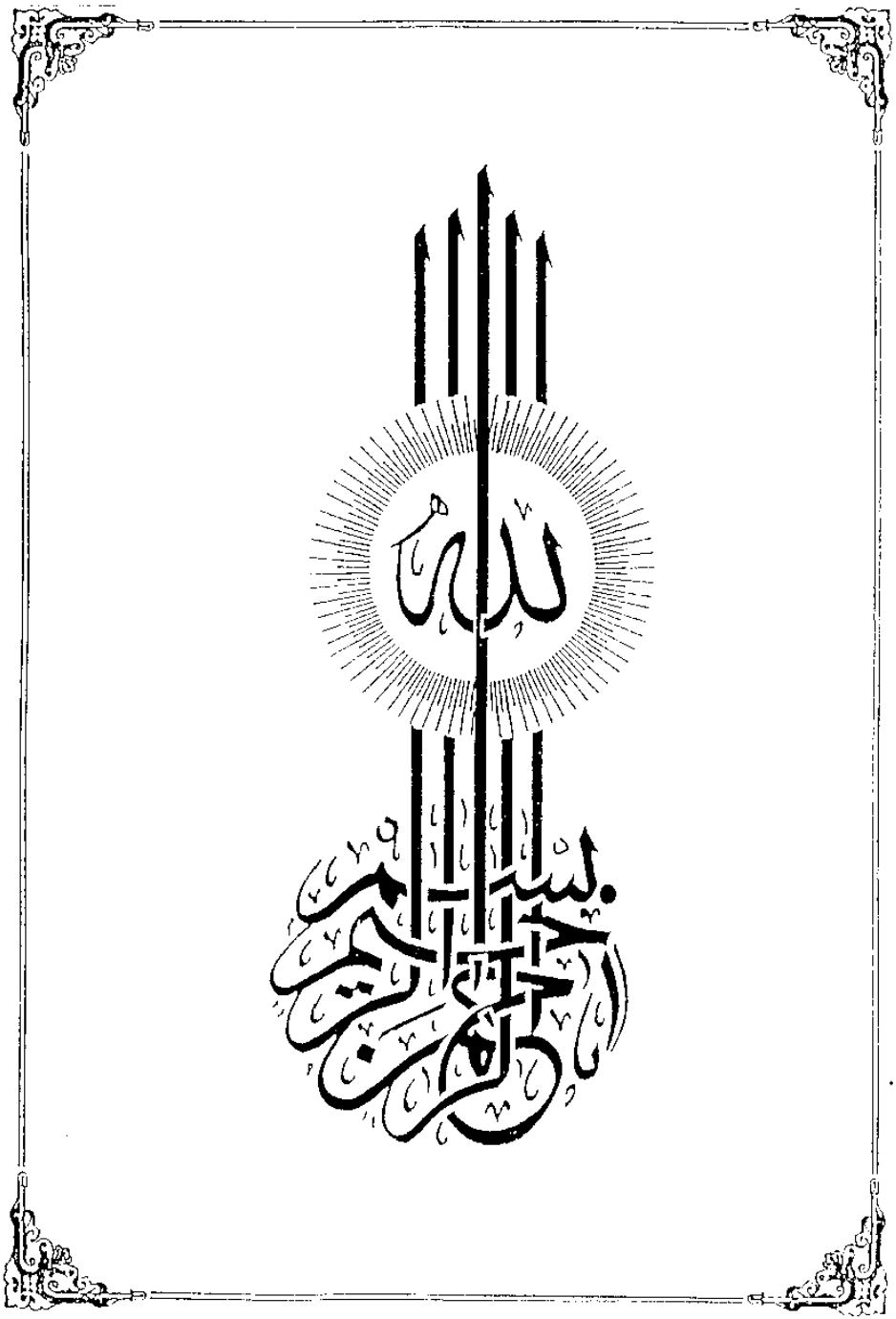

CONTENTS

* INTRODUCTION 1
* AIM OF WORK 5
* REVIEW OF LITERATURE

Adipose Tissue 6
* Development of adipose tissue 8
* Specificity of fatty tissue 15
* Structure of adipose tissue 16
* Blood supply of adipose tissue 18
* Distribution of fatty tissue 19
* Function of adipose tissue 24
Alloplastic Tissue Substitutes 27
Transplantation of Tissue 63
Fat grafts 70
* MATERIAL AND METHODS 102
* RESULTS 127
* DISCUSSION 161
* SUMMARY 176
* REFERENCES 182
* ARABIC SUMMARY

INTRODUCTION

AND

AIM OF WORK

INTRODUCTION

The treatment of the ugly depressions and the unsightly subcutaneous deficiencies are challenging problems to the plastic surgeons.

Surfaces affected by soft tissue defects may be apparent as for example: the face, neck or the arms; or hidden like the thighs, abdominal walls or the buttocks. These unsightly depressions present an esthetic problem especially to females.

To fill up these depressions many techniques had been used with different materials: synthetic or natural materials as autogenous or homogenous implants *(Blocksma and Braley, 1979 and Peer, 1977)*. Homogenous grafts were not popular in the history of transplantation as it was found out soon that it is rejected by the body.

The autogenous tissues that were used to fill up the depressions or the tissue defects could be one of the following in addition to fat: muscles, dermis, fascia lata, omentum, musculo-cutaneous and fascio-musculo-cutaneous.

Each type has its special indications with advantages and drawbacks of its uses. The muscles are usually used as flaps or free vascularised grafts because the survival of the muscle depends mainly on a vascular pedicle *(Vasconez and Logan, 1983)*. Despite the viability of free vascularised muscle graft, it will undergo atrophy after a

while and the original bulk or volume desired will be lost.

Omental transfer presents a good solution for restoring the facial contour in cases of hemifacial atrophy or cheek depression after tumor excisions. The free vascularised omental flap was described by *Harii and Wallace et al. in 1979* to restore the facial contour in Romberg's disease. *Upton et al. in 1980* reported on a modification of the procedure to solve the problem of the descent of omental tissue to dependent sites due to gravity, they created three pockets by dissecting septa and distributed the omentum.

Fascia lata grafts are usually used for the support of paralyzed facial musculature and other surgical indications as to fill defects in the chest wall. Most of the authors believe that the transplant of fascia lata survives intact and the fibroblasts of the fascia remain viable and are not replaced by host cells *(Thompson, 1979)*.

By the understanding of muscular blood supply and the skin territories supplied by fascial arteries and fasciocutaneous perforators, the use of musculo-cutaneous and fascio-musculo-cutaneous grafts had been established. The development of micro-surgery made the uses of these tissues as grafts possible *(Vasconez and Logan, 1986)*.

The use of fat grafts to fill up depressions began long ago in the history of surgery by Van

der *Meulen in 1889*. Fat was always associated with dermis as the fat alone had gained the reputation of being absorbed and most of its volume was lost *(Peer, 1959)*.

In 1977, the french esthetic surgeon Y.G. Illouz developed a technique for liposuction (Suction Assisted Lipectomy). He was the first to introduce the technique into the field of plastic surgery and to solve the problem of excessive fat deposition in certain sites of the body. The aspirated fat contained: living and dead fat cells, groups of fat cells together, triglycerides, serum and blood. *Since June 1983, Illouz* began to use this aspirated fat to correct defects caused by this same technique or to fill other accidentally acquired depressions like: dimples, depressions or hollows. He hoped that these "grafts" would succeed based on the following reasoning, in his own words, "At present time, free autografts do not take because we try to graft organized fatty tissue (a compact unit of adipocytes) which does not survive long enough to be vascularised by new vessels formation. On the other hand, fat tissue aspirated under strong vacuum is no longer an organized tissue and the fat cells are virtually separated from each other. It appears that when these cells are introduced into the same organism, they can survive by osmosis before being vascularised by new vessels. Furthermore I felt that this graft was possible because it really constituted a fat cell culture,

cell cultures always have more chance of success than grafts" *(Illouz, 1986)*.

In this work, we will try to explore this hypothesis and will try to find out the theoretical and clinical differences between different types of fat grafts. At the end of our study we would be able to judge the fate of different types of fat grafting and the aspirated fat in particular.

AIM OF THE WORK

This work aims at the study of the fate of fat cells obtained by suction when grafted alone.

A comparison will be made between the fate of these grafts on one hand and the free non-vascularised fat when grafted as a lump or as dermo-fat or as a vascularised fat grafts on the other hand.

Hopefully, the results of this study would help the debate on the choice of the best procedure used for fat grafting in a given situation.

REVIEW OF LITERATURE

ADIPOSE TISSUE

Adipose tissue is a special form of connective tissue in which large numbers of fat cells organized into lobules form its main constituent.

The connective tissues are derived from the mesenchyme. They include a number of tissues which have a passive function. They differ considerably from each other in appearance and in functions, but present many points of resemblance. All the connective tissues consist of cells embedded in a matrix or ground substance in which fibers may or may not be present. The cells consist of seven principal varieties which are: fibroblasts histiocytes, adipocytes, mast cells, plasma cells, pigment cells and the reticular cells. The matrix protects and binds the elements of the connective tissue together, it provides the medium for the movement of cells and the diffusion of the metabolites between the vascular system and the cells of the tissue itself.

The fibers that are found in connective tissues are of three types:- collagen fibers - reticular fibers and elastic fibers. The content of the connective tissue in fibers varies in proportion at different places.

In the different regions of the body, the appearance, consistency and composition of the connective tissue differ considerably according to the function requirements. These differences are

related to the predominance or not of one or more of the cell type or fiber. The arrangement of fibers and the amount and character of the matrix also play a role. On these basis the connective tissues are classified into:

- Areolar or loose connective tissue.
- Adipose tissue.
- White fibrous tissue.
- Elastic tissue.
- Reticular tissue.
- Mucoid tissue.

Fat cells are found singly or in groups in loose connective tissue. In adipose tissue the fat cells occur in great abundance and constitute its major component. The body contains two different kinds of adipose tissue: white fat and brown fat. Almost all the human adipose tissue is white fat, it has a yellow tint due to its carotene content, it forms most of the adult human adipose tissue. The brown fat is a special kind of fat which is only abundant in newborns and occurs only near the kidneys in adults, it has a brown color because of its rich capillary blood supply and because its cells contain numerous mitochondria and are therefore rich in cytochromes.

Adipose tissue presents as a large accumulation of fat-storing cells that form lobular masses supported by connective tissue septa. The white adipose tissue comprises 10% to 20% of the body weight in adult male and 15% to 25% in adult females *(Cornak, 1987)*. The white adipose tissue constitutes a relatively large diffuse organ as it

is represented by all the subcutaneous fatty tissue in addition to some fat collection at the kidney regions and at the mesenteries.

Due to the multiplicity of function of adipose tissue its classification or position among the family of tissues is difficult. Originally it was assumed that it is one form of loose connective tissue due to the fact that this later contains some fat cells and due to its function in padding and filling. Today, some authors regard it as a special form of reticular connective tissue, others refer to it as a reticulo-endothelial organ and others are inclined to consider it as a single fat organ *(Smahel, 1986)*.

DEVELOPMENT OF ADIPOSE TISSUE:

The development of subcutaneous adipose tissue starts with "Primitive Organs" or Fat islands which appear in the subcutis from the fourth fetal month on. These are small reticulo-endothelial structures that form the basis for individual fat lobules that develop later in life. These embryonic reticulo-endothelial primitive organs are the adipocytes precursors that are pericapillary mesenchymal cells. Many small lipid droplets appear in the cytoplasm of these preadipocyte precursors giving it the round appearance during development of the embryo. The droplets enlarge and coalesce forming a large single drop which displaces the nucleus to one side and the cytoplasm to the periphery.

The brown adipose tissue develops as the white but in other and definite parts of the body as the dorsocervical and interscapular regions. The primitive organs of brown adipose tissue accumulate fat droplets in small locules i.e. it is a multilocular type. The most characteristic feature of the brown adipose tissue is the early isolation of free fat cells, in contrast to the cells of white organs that begin to accumulate fat when they are still in their original shape and mutual relationship *(Wassermann, 1965)*.

In many different tissues, early precursors of mature cell types can be identified by detecting the cell-specific protein during morphogenesis; but whether a cell-specific protein can be used to identify fat cells precursors or not is still debated *(Greenwood, 1985)*. Several recent electron microscopic studies on developing and regenerating adipose tissues support the hypothesis that state that the precursor of fat cells develop from a fibroblast-like cell type that codevelop in the presence of differentiating blood vessels. This agrees with what had been said by *Smahel in 1986,* that the original function of the primitive organs is to form blood cells; this function ceases with the fat storing supervening.

There is very limited knowledges of the earliest stages of adipocyte histogenesis, but considerable data were found in the description of the general postnatal development of adipose tissue fat cellularity and its regulation.