La Médecine Régénérative
Un complément à la médecine rééducative

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PRODUCTS
**BLOOD COMPOSITION:**
- 94.1% Red blood cells
- 0.2% White blood cells
- 5.7% **Platelets**
Artificial dermis
Acellular adipose matrix

Fat Microfat Nanofat

Mechanical preparation

LIPOGEMS
- P. Tonnard
- Tulip®
- Planas®
- Adinizers®
- Lipocube®

NANOFAT

SVF GEL
Lipocondensation
Stromal aggregates

MSCs Mesenchymal Stem Cells
% Concentration
Number of cells

ATMP

PRF Platelet Rich Fibrin
% Concentration
Number of Platelets

PRP Platelet Rich Plasma
% Concentration
Number of Platelets

SVF Stromal Vascular Fraction
% Concentration
Number of cells

ATMP

Cells counter - Cytometer

Mixed Products

Cells counter
I – MILLI - Sydney COLEMAN

**HARVESTING**

- 2.23mm

**PURIFICATION**

- 3000 RPM - 3 min - 1200G

**REINJECTION**

- 17G cannula (O.D. = 1.50mm)
  - Distal opening 2 mm
  - 1 ml Luer Lock syringe

1mm incision with a #11 surgical blade

The cannula creates several tunnels

S.R.COLEMAN’s harvesting cannula: 17 G
II – MICRO material

HARVESTING CANNULA

Ø=2mm – 14 Gauge – 130mm

S=0.58 mm²

INJECTION CANNULA

Ø=0.8mm – 21 Gauge – 40mm

FILTRATION BAG CLOSED SYSTEM
Mesenchymal Stromal Cells (MSC)

The Fate of Adipocytes after Nonvascularized Fat Grafting: Evidence of Early Death and Replacement of Adipocytes

Fig. 6. Conclusive schema for three zones of the grafts. The most superficial zone is the “surviving zone,” which is less than 300 μm thick. In the surviving zone, both adipocytes and adipose-derived stromal cells (ASCs) survive. The second zone is the “regenerating zone,” the thickness of which varies depending on the microenvironmental conditions such as vascularity of and attachment to the surrounding tissue. In this zone, adipocytes die as early as day 1, but adipose-derived stromal cells survive and provide new adipocytes to replace the dead ones. The most central zone is the “necrotic zone,” where both adipocytes and adipose-derived stromal cells die, no regeneration is expected, and the dead space will be absorbed or filled with scar formation.
Mechanical Preparation of Fat

TULIP

LIPOCUBE

HY-NANOFAT

MICROLYSER

ADINIZER
Emulsification with connectors of 2.1mm – 30 passages
30 gauge – needle 0,25mm
Emulsified  x40 Optical Microscope
NANOFAT – EMULSIFIED FAT

I. LOCATION AND DEPTH OF SAMPLING
II. INFILTRATION OR NOT?
III. SIZE OF THE SYRINGES
IV. CANNULAS
    SIZE OF THE HARVESTING CANNULA
    SIZE AND NUMBERS OF HOLES
    SHARP MICROPORTS
V. PURIFICATION STEP OF FAT:
    DECANTATION,
    CENTRIFUGATION
    FILTRATION
VI. SIZE OF THE CONNECTORS
VII. NUMBER OF PASSES 20-30-60?
VIII. SIZE OF THE FILTERS
    NUMBER OF FILTERS 120 microns, 500 microns, 629 – 394 microns

WE NEED VERY PRECISE PROTOCOL WITH BIOLOGICAL CHARACTERIZATION OF THE FINAL PRODUCT
Each modification changes the final product
IV – STROMAL VASCULAR FRACTION

ADIPOSE DERIVED REGENERATIVE CELLS - ADRCs

- **MANUAL TREATMENT** in a clean room or laboratory according to the cGMP

- **AUTOMATIC TREATMENT** using a CE marked device, labeled to replace, repair, reconstruct or increase soft tissue defects.
SVF-STROMAL VASCULAR FRACTION: Cellular Composition

- Endothelial Cells: 7%
- Vascular Smooth Muscle Cells: 9%
- Tissue Macrophages: 23%
- WBCs: 22%
- CD34+/CD31-: 37%
- Stem Cells: 2%

Viability: about 400,000 cells per gram of adipose tissue
ATMP: Advanced Therapy Medicinal Products

Cells or Tissues have been subject to substantial manipulation, so that biological characteristics, physiological functions or structural properties relevant for the intended indication or regeneration are achieved

OR

Cells or Tissues are not intended to be used for the same essential function in the recipient as in the donor (non homologous use)

MTI: Médicaments de Thérapie Innovante
QUALITY CONTROL

- STERILITY
- CELL NUMBER
- VIABILITY
- CELL POPULATION ANALYSIS
- COLONIES FORMING UNIT
VI – PLATELET RICH PLASMA

Whole blood

Centrifugation

Density (g/ml)

- Plasma: 1026
- Platelets: 1058
- Monocytes: 1062
- Lymphocytes: 1070
- Neutrophils: 1082
- Red Blood Cells: 1100

PRP
PRP NEW CONCEPT : CHARACTERIZATION

COLLABORATION WITH MEDICAL ANALYSIS LAB

MINIATURE CELL COUNTER INSIDE OPERATING ROOM

HEMATOLOGIC CELL COUNTER
One drop of blood or PRP
Results within 1 minute

To day

To morrow...
Promoting Fat Engraftment

CAL: CELL ASSISTED LIPOTRANSFER
A POPULAR PROCEDURE...

PRP

EASY
FAST
ECONOMICALLY VIABLE

FVS

DIFFICULT
LONG
EXPENSIVE

ADIPOSE TISSUE

Cultured Stem Cells (ASCs)

VII – MIXTURES
CELLULAR THERAPIES

- **Volumizing effect** Fat tissue: MILLI - MICRO
  - Replacement of missing tissues with autologous fat

- **Regenerative effect** Fat tissue:
  - Mechanical preparations of **FAT-NANO = EMULSIFIED FAT**
  - Enzymatic preparation - **STROMAL VASCULAR FRACTION**
  - Modified emulsified fat - SVF Gel
    - Lipocondensation
    - Stromal aggregates

- **Regenerating effect:**
  - **PLATELET RICH PLASMA**
<table>
<thead>
<tr>
<th>COLEMAN</th>
<th>MACRO</th>
<th>MICRO</th>
<th>NANO</th>
<th>SVF</th>
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<tbody>
<tr>
<td><strong>HARVESTING</strong></td>
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<tr>
<td>11G 3mm</td>
<td>12G 2,5mm</td>
<td>14G 2mm</td>
<td>14G 2mm</td>
<td>11G 3mm</td>
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<thead>
<tr>
<th>PLACEMENT</th>
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<tbody>
<tr>
<td>17G 1.2mm</td>
<td>14G 2mm</td>
<td>21G 0.8mm</td>
<td>27G - 30G</td>
<td>25G 0.5mm</td>
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<thead>
<tr>
<th>STANDARD PROCEDURE</th>
<th>BREAST</th>
<th>FACE</th>
<th>SKIN - DERMIS</th>
<th>STANDARD PROCEDURE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PROCEDURE</strong></td>
<td>BUTTOCK</td>
<td>HANDS</td>
<td>SUBDERMAL MUCOSA</td>
<td><strong>PROCEDURE</strong></td>
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<tr>
<td><strong>PROCEDURE</strong></td>
<td>LIMBS</td>
<td>GENITALS</td>
<td></td>
<td><strong>PROCEDURE</strong></td>
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INDICATIONS
SCARS

HAND BURNS  8 cc
SCARS

HAND RADIODERMATITIS

6 cc
SCARS

ADHERENT SCAR 12 cc
INTEREST OF AUTOLOGOUS ADIPOSE TISSUE ON THE RAYNAUD’s PHENOMENON

« Fat Grafting to the Hand in Patients with Raynaud Phenomenon: A Novel Therapeutic Modality »

Jonathan Bank, M.D., Sam M. Fuller, M.D., Ginard I. Henry, M.D.
Lawrence S. Zachary, M.D.

Plastic and Reconstructive Surgery • May 2014, vol 133, number 5

Conclusions: Preliminary results of fat grafting to the hands of patients with Raynaud phenomenon revealed improved symptomatology with evidence suggestive of measurably increased perfusion in some cases. Fat grafting may benefit the management of this patient population. (Plast. Reconstr. Surg. 133: 1109, 2014.)
Fig. 1. Fat grafting to the dorsum of the hand. Stab incisions are made, and blunt cannulae are used to introduce small aliquots of fat for a total of 10 to 15 ml in the dorsum of the hand; 2 to 3 ml in the snuffbox; 1 to 2 ml in each dorsal webspace.
Fig. 2. Fat grafting to the palm of the hand. Using a technique similar to that used for the dorsum of the hand, fat is grafted for a total of 3 to 4 ml along the superficial palmar arch; 1 to 2 ml in volar webspaces 2 to 4; and 2 to 3 ml in the first webspace.
WOUNDS

Hands ulcerations

Microfat / PRP (80/20%)
Total injected: 2cc
Hands ulcerations

Two months results
CONCLUSION

• Regenerative medicine of the hand is a major issue.
• Physiotherapists need to know the products and techniques available.