AN AUTOLOGOUSLY GENERATED PLATELET-RICH PLASMA MEMBRANE MAY ENHANCE PERIPHERAL NERVE REGENERATION
our experience since 2010
Peripheral nerve surgery aims to restore structural and functional integrity of damaged neurons.

Despite both surgical techniques and the understanding of nerve regeneration progressed a lot, in the last decades, severe lesions of major nerve trunks still impair functionality even after surgical neurorrhaphy.
NERVOUS TISSUE

**SCARCE** REGENERATIVE CAPACITY

**ONE OF** THE SLOWEST REGENERATIVE PROCESS IN THE BODY

**THE SCAR** FORMATION IS AN INEVITABLE RESULT OF SURGERY, RESPONSIBLE FOR INCOMPLETE RECOVERY

**EPINEURAL** CONNECTIVE MAY AFFECT A MECHANICAL BARRIER TO AXONAL REGENERATION

**EXTRANEURAL** SCARRING MAY LEAD TO THE ADESION OF NERVES TO ADJACENT TISSUE

**THEREFORE**

**REDUCING** EPINEURAL AND EXTRANEURAL SCAR FORMATION MAY IMPROVE THE OUTCOME AFTER NERVE INJURY

**A SURGICAL** REPAIR ASSOCIATED WITH THE USE OF BIOACTIVE FACTORS, REGULATING THE CONNECTIVE PROLIFERATION, CAN PERFORM AXOPLASMIC MIGRATION INTO THE DISTAL STUMP
**PRP**

PLATELET-RICH PLASMA (PRP) IS DEFINED AN “AUTOLOGOUS” CONCENTRATION OF PLATELETS IN A SMALL VOLUME OF PLASMA

THE BIOACTIVE PROTEINS FOUND IN PLATELETS AND PLASMA CONTROL THE NERVE HEALING REDUCING THE SCAR FORMATION AND SUPPORTING FIBER NERVE REMYELINATION

RELEASEING LARGE QUANTITIES OF GROWTH FACTORS (PRGs) FRAGMENT COULD POLYMERIZE INTO PLATELET-RICH GEL WITH SCAFFOLDING EFFECT

**OUR EXPERIENCE**

MEMBRANE DIRECTLY IN CONTACT WITH THE NERVE
SEVERE COMPRESSION OF MEDIAN NERVE – VDC INEVOCABLE E/O THENAR ATROPHY

MEMBRANE SUTURED AROUND THE NERVE NEURORRAPHY AS “A GUIDE”
MEDIAN NERVE – ULNAR NERVE LESIONS IN HUMANS

MEMBRANE SUTURED AROUND IN A RAT SCIATIC NERVE MODEL.
SEVERE COMPRESSION OF MEDIAN NERVE

**Preoperative Clinical Appearance**

**PRP Membrane**

**Intraoperative Median Nerve Appearance**

**PRP Membrane Positioning**

**30 Days After Surgery**

---

**Esame di conduzione nervosa**

Prof. Gabriele Siciliano

<table>
<thead>
<tr>
<th></th>
<th>Motoria</th>
<th>Sensitiva</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ampiezza polso (mV)</td>
<td>Latenza distale (ms)</td>
</tr>
<tr>
<td><strong>Pre</strong></td>
<td>Post</td>
<td>Pre</td>
</tr>
<tr>
<td>PRP</td>
<td>2</td>
<td>3,5</td>
</tr>
<tr>
<td>Var. 32%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No PRP</td>
<td>3</td>
<td>5,12</td>
</tr>
<tr>
<td>Var. 30%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Significatività valori postop. | P = 0,39 | P = 0,8 | P = 0,79 | P = 0,3 |
| Significatività valori pre/post operatori | Prp P=0,46 | Prp P=0,15 | Prp P=0,0006 | Prp P<0,0001 |

Pisa 2014 WORKSHOP “Ricerca e Innovazione Clinica”
ULNAR NERVE LESION

PREOPERATIVE CLINICAL APPEARANCE

INTRAOPERATIVE ULNAR NERVE APPEARANCE

INTRAOPERATIVE ULNAR NERVE APPEARANCE

6 MONTHS AFTER SURGERY

Pisa 2014 WORKSHOP “Ricerca e Innovazione Clinica”
RAT SCIATIC NERVE MODEL

(a) Macroscopic appearance of the suturable platelet-rich plasma membrane; (b) exposed sciatic nerve; (c) sciatic nerve cross sectioned (d) appearance of the treated sciatic nerve

Macroscopic appearance of the rat sciatic nerve at necropsy 6 weeks postsurgery from a treated animal. Still evident (arrowhead) the presence of platelet-rich plasma membrane residue.

Histological appearance of the surgical area; (a) untreated nerve at 6 weeks; (b) untreated nerve at 12 weeks; (c) treated nerve at 6 weeks; and (d) treated nerve at 12 weeks. Osmium tetroxide impregnation, scale bar 50 μm.

Elisabetta Giannessi, DVM1 Alessandra Coli, DVM, PhD1 Maria Rita Stornelli, DVM1 Vincenzo Miragliotta, DVM, PhD1 Andrea Pirone, MSc(Biol), PhD1 Carla Lenzi, MSc(Biol), PhD1 Silvia Burchielli, DVM2 Giovanni Vozzi, PhD3 Carmelo De Maria, PhD3 Margherita Giorgetti, MD4

Department of Veterinary Sciences, University of Pisa, Pisa, Italy
Gabriele Monasterio Foundation, Institute of Clinical Physiology, National Research Council, Pisa, Italy
Department of Information Engineering, Center “E. Piaggio,” University of Pisa, Pisa, Italy
Department of Musculoskeletal and Skin Diseases, and Hand Surgery, Azienda Ospedaliera Universitaria Pisana, Pisa, Italy

Pisa 2014 WORKSHOP “Ricerca e Innovazione Clinica”
The mechanisms whereby PRP might improve tissue healing/ regeneration are still unclear, however.

Our data in humans and in a rat sciatic nerve model show that the application of a PRP fibrin membrane around the neurorraphy improves the nerve regeneration process.

The use of PRP as a sutable or conctac membrane could perform an action not only as a source of bioactive proteins but also as a nerve guide to hold the scar reaction and thus improve axonal regeneration.

We should use PRP immediately, but it is difficult.

Thank for your attention