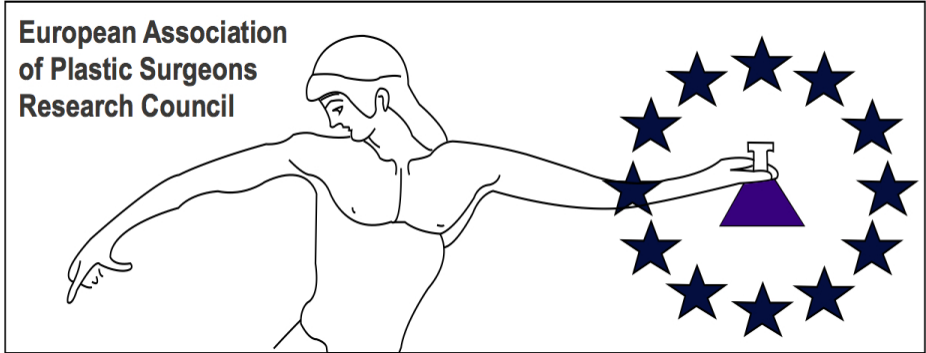


EURAPS RESEARCH COUNCIL



ABSTRACTS BOOK

THIRD ANNUAL MEETING

MAY 28-29, 2014
LACCO AMENO
ISLE OF ISCHIA, ITALY

Research Council of European Association of Plastic Surgeons

MISSION

- To promote the excellence of basic research in Plastic Surgery;
- To furnish an annual Forum for recent scientific research work in Plastic Surgery;
- To stimulate communication and translation of research and investigation at the European level;
- To coordinate various forms of investigational and laboratory teaching.

ORIGIN

The primary idea to initiate a research platform for basic research in Plastic Surgery was to foster the quality of scientific work in the field. Three members of EURAPS (Alfred Berger, Willy Boeckx and Roy Sanders) decided during the 8th annual EURAPS meeting in Amsterdam to initiate a research platform for young investigators and researchers, involved in basic research for Plastic Surgery.

SCIENTIFIC MEETINGS

The First Scientific Meeting took place in Hannover, Germany on October 8-9th 1997. From the beginning, the meeting focused on young scientists to present their ideas and innovations in basic research, relevant for the whole field of Plastic Surgery. The abstracts were published in the European Journal for Plastic Surgery and each following year, a different European city was chosen to host the meeting.

DATE OF CONSTITUTION AS EURAPS RESEARCH COUNCIL

The Council was established during the 22nd EURAPS meeting in Mykonos on June 3rd, 2011 and it was named European Association of Plastic Surgeons Research Council. The by-laws were integrated into the EURAPS by-laws and approved (Article III, section 4).

Date and Location of EURAPS Research Council Meetings

1st EURAPS Research Council Meeting

May 23-24, 2012 - Munich, Germany

Organised by Hans-Guenther MACHENS (Chair 2012)
Arndt SCHILLING (Secretary 2012-2013) - Munich, Germany

2nd EURAPS Research Council Meeting

May 22-23, 2013 - Antalya, Turkey

Organised by Selahattin ÖZMEN (Chair 2013)
Arndt SCHILLING (Secretary 2012-2013) - Munich, Germany

3rd EURAPS Research Council Meeting

May 28-29, 2014 - Isle of Ischia, Italy

Organised by Benedetto LONGO (Chair 2014)

4th EURAPS Research Council Meeting

May 27-28, 2015 - Edinburgh, Scotland

Organised by Andrew HART (Chair 2015)
Benedetto LONGO (Secretary 2015) - Rome - Italy

**EURAPS Research Council (former ECSAPS) BEST PAPERS
Presented at the Meetings of the EURAPS**

- 1998 Irene MATHIJSSSEN - Rotterdam , The Netherlands
1999 Dennis VON HEIMBURG - Aachen, Germany
2000 Neil BULSTRODE - Northwood, United Kingdom
Laurence BOON - Brussel, Belgium
2001 Joy ODILI - Northwood, United Kingdom
2002 Dolores WOLFRAM - Innsbruck, Austria
2003 Brigitte PITTET-CUÉNOD - Geneva, Switzerland
2004 Yves HARDER - Bern, Switzerland
2005 Bran SIVAKUMAR - London, United Kingdom
2006 Karsten HEMMRICH - Aachen, Germany
2007 Nicole LINDENBLATT - Zurich, Switzerland
2008 Sophie DANN - Middlesex, United Kingdom
2009 David SIMONS - Aachen, Germany
2010 Pietro DI SUMMA - Lausanne, Switzerland
2011 Warren R.L. CAIRNS - Venice, Italy
Tomás EGANA - Munich, Germany
Gerrit GRIEB - Aachen, Germany
Tim NIJHUIS - Rotterdam, The Netherlands
Thilo SCHENCK - Munich, Germany
Miao TONG - Rotterdam, The Netherlands
2012 Yves HARDER - Munich, Germany
Peter NELSON - Munich, Germany
Eva PLACHETA - Vienna, Austria
Ann J. RECKJENRICH - Munich, Germany
Farid REZAEIAN - Munich, Germany
Rohit SETH - London, United Kingdom
Jennifer VERHOEKX - London, United Kingdom
2013 Pawel SZYCHTA - Livingston, United Kingdom
Mayuran SATHTHIANATHAN - Sydney, Australia
Ersoy KONAS - Ankara, Turkey
Dominik LÉVIGNE - Geneva, Switzerland
-

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CONGRESS VENUE

LACCO AMENO, ISLE OF ISCHIA, ITALY

CONGRESS CENTRE “ANGELO RIZZOLI”

SPONSORS

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DERMORESEARCH

PROGRAM AT A GLANCE

WEDNESDAY, MAY 28, 2014

- 7.30-8.15** **REGISTRATION** at the Congress Centre “Angelo Rizzoli”
- 8.20-10.00** **SCIENTIFIC SESSION No. 1, REGENERATIVE MEDICINE**
Session chairpersons:
Arndt F. SCHILLING, Munich, Germany
Monika MATTESICH, Innsbruck, Austria
- 8.20 THE EFFECT OF SHEAR STRESS IN AUTOLOGOUS FAT GRAFTING**
Nadia MENZI, Rik OSINGA, Laurent André Hong TCHANG, Daniel CAVIEZEL, Arnaud SCHERBERICH, Dirk Johannes SCHAEFER, Renè Denis LARGO, Basel, Switzerland
- 8.30 STROMAL VASCULAR CELL COMPOSITION OF THE LOW AND HIGH DENSITY FRACTIONS OF CENTRIFUGATED LIPOASPIRATE.**
Alessio CAGGIATI, Antonia. GERMANI, Mario PICOZZA, A. DI CARLO, Rome, Italy
- 8.40 FAT GRAFTING AND ADIPOSE STEM CELLS: EVALUATION OF DIFFERENT TECHNIQUES**
Sarah CALABRESE, Rossana DOMENIS, Daniela CESSELLI, Lara LAZZARO, Fabrizio DE BIASIO, Daria ALMESBERGER, Chiara ZANIN, Pier Camillo PARODI, Udine, Italy
- 8.50 CHARACTERISATION OF HUMAN ADIPOSE TISSUE DERIVED STEM CELLS WITH ENHANCED ANGIOGENIC AND ADIPOGENIC PROPERTIES**
Anne Therese LAUVRUD, Mikael WIBERG, Paul KINGHAM, Umeaa, Sweden
- 9.00 IMPACT OF LIDOCAINE AND ADRENALINE ON SURVIVAL AND PROLIFERATION OF HUMAN ADIPOSE-DERIVED STROMAL/ PROGENITOR CELLS**
Monika MATTESICH, Susanne HOERL, Maria C. MITTERBERGER-VOGT, Ursula ROSTEK, Asim EJAZ, Gerhard PIERER, Werner ZWERSCHKE, Innsbruck, Austria
- 9.10 ADIPOSE DERIVED PERIVASCULAR STEM CELLS ARE A SOURCE OF PURIFIED AUTOLOGOUS MESENCHYMAL STEM CELLS FOR REGENERATIVE MEDICINE - IS THE NEED FOR EX-VIVO CULTURE OVER?**
Christopher C. WEST, Iain R. MURRAY, W. Reef HARDY, Xinli ZHANG, Aaron JAMES, Ken STEWART, Kang TING, Chia SOO, Bruno PÉAULT, Edinburgh, United Kingdom
- 9.20 IN VIVO EFFECTS OF AUTOLOGOUS FAT GRAFTING: A REFINED EXPERIMENTAL MODEL**
Erica DALLA VENEZIA, Alice BARONCINI, Vincenzo VINDIGNI, Franco BASSETTO, Giorgio GIATSIDIS, Padua, Italy
-

9.30 HISTOPATHOLOGIC AND MOLECULAR EFFECTS OF ADIPOSE DERIVED STEM CELLS ON RABBIT EAR HYPERTROPHIC SCAR MODEL

Bora Edim AKALIN, Bülent SAÇAK, Ceyda CÖREK, Betül ÇATALGÖL, Özlem Tuğçe ÇILINGIR, Feriha ERCAN, Istanbul, Turkey

9.40 GENE THERAPY IN REGENERATIVE SURGERY

Giorgio GIATSIDIS, Erica DALLA VENEZIA, Franco BASSETTO, Padua, Italy

9.50 THE WHITE ADIPOSE TISSUE USED IN LIPOTRANSFER PROCEDURES IS A RICH RESERVOIR OF CD34+ PROGENITORS ABLE TO PROMOTE CANCER PROGRESSION

Mario RIETJENS, Francesca DE LORENZI, Francesco BETOLINI, Ines MARTIN-PA-DURA, Jean Yves PETIT, Milan, Italy

10.00 End of Session

10.00-10.20 Coffee Break

10.20-12.00 SCIENTIFIC SESSION No. 2, NERVE REGENERATION

Session chairpersons:

Elisabeth A. KAPPOS, Basel, Switzerland

Giorgio GIATSIDIS, Padua, Italy

10.20 INNERVATION OF PREFABRICATED FLAP: A NEW EXPERIMENTAL MODEL

Giuseppe CUCCIA, Marco ROMEO, Shan Shan QIU, Bernardo HONTANILLA, Stefano GEUNA, Palermo, Italy

10.30 AUTOLOGOUS NERVE FRAGMENTS IMPLANTED AROUND DISTAL PERIPHERAL NERVE SUTURES ENHANCE NERVE REGENERATION

Giovanni ZABBIA, Alessio MARIOLO, Grazia SALIMBENI, Carla CANNIZZARO, Anna MAROTRANA, Fulvio PLESCIA, Adriana CORDOVA, Salvatore D'ARPA, Francesco MOSCHELLA, Palermo, Italy

10.40 A NEW POSSIBILITY TO FILL UP PERIPHERAL NERVE GAPS UP TO 2 CM USING A JALURONIC ACID TUBES: AN EXPERIMENTAL STUDY

Luigi ANNACONTINI, Monica RUCCI, Domenico PARISI, Luigi CAGIANO, Antonio IANNELLI, Aurelio PORTINCASA, Foggia, Italy

10.50 COLLAGEN (NEURAGEN®) NERVE CONDUITS AND STEM CELLS FOR PERIPHERAL NERVE GAP REPAIR

Pietro DI SUMMA, Paul KINGHAM, Corrado CAMPISI, Wassim RAFFOUL, Daniel KALBERMATTEN, Lausanne, Switzerland

11.00 PERIPHERAL NERVE REPAIR: MULTIMODAL COMPARISON OF REGENERATIVE POTENTIAL OF ADIPOSE DERIVED CELLS IN A BIODEGRADABLE CONDUIT

Elisabeth Artemis KAPPOS, Patricia Esther ENGELS, Moritz MEYER ZU SCHWABEDISSEN, Mathias TREMP, Stefanie VON FELTEN, Arne FISCHMANN, Arnaud SCHERBERICH, Dirk SCHAEFER, Daniel KALBERMATTEN, Basel, Switzerland

11.10 ACELLULAR NERVE ALLOGRAFTS FOR PERIPHERAL NERVE DEFECTS BRIDGING: AN INNOVATIVE DECELLULARIZATION METHOD

Filippo BORIANI, Nicola FAZIO, Caterina FOTIA, Nicoletta ZINI, Nicola BALDINI, Bologna, Italy

11.20 ADIPOSE-DERIVED STEM CELLS ENHANCE AXONAL REGENERATION THROUGH CROSS-FACE NERVE GRAFT

Abbas Ozan LUAY, Huseyin BORMAN, Ahmet Çağrı UYSAL, Leyia AYDIN, Fatma HELVACIOĞLU, Şebnem İIHAN, Burak ÖZKAN, Erhan COŞKUN, Atilia Adnan EYÜBOĞLU, Ankara, Turkey

11.30 THE USE OF ELECTRON MICROSCOPY TO STUDY SERIAL SECTIONS OF AXONAL REGENERATION IN THE FACIAL NERVE

Jonathan LECKENBY, Richard SCHALEK, Seymor KNOWLES-BARLEY, Jeff W. LICHTMAN, Adriaan GROBBELAAR, Cambridge, Massachusetts, USA

11.40 MRI MONITORING IN NERVE ROOT COMPRESSION TREATED BY REGENERATIVE CELLS

Patricia K. SIEBER, Elisabeth A. KAPPOS, Patricia E. ENGELS, Robyn M. BENZ, Arne FISCHMANN, Dirk J. SCHAEFER, Stefan SCHAEREN, Daniel F. KALBERMATTEN, Basel, Switzerland

11.50 ASSESSMENT OF EAR MOVEMENT IN TRANSGENIC MICE: A NEW ANIMAL MODEL TO ACCURATELY MEASURE SURGICAL OUTCOMES

Jonathan LECKENBY, Jeff W. LICHTMAN, Adriaan GROBBELAAR, Cambridge, Massachusetts, USA

12.00 THE PROXIMAL MEDIAL SURAL NERVE BIOPSY MODEL: A STANDARDIZED AND REPRODUCIBLE CLINICAL MODEL FOR THE EVALUATION OF BIOARTIFICIAL NERVE GUIDES

Ahmet BOZKURT, Sabien VAN NEER VEN, Kristi G. CLAEYS, Dan Mon O'DEY, Angela SUDHOFF, Gary A. BROOK, Bernd SELHAUS, Bernd SCHULZ, Jörg B. SCHULZ, Joachim WEIS, Norbert PALLUA, Aachen, Germany

12.10 End of Session

12.30-13.30 Lunch - Visit to the exhibitors

**13.30-15.20 SCIENTIFIC SESSION No. 3, SOFT TISSUE AND BONE
REGENERATION**

Session Chairpersons:

Hans-Günther MACHENS, Munich, Germany

Stefan HACKER, Vienna, Austria

**13.30 NATIVE IMMUNITY AND TISSUE REPAIR: THE ROLE OF INFLAMMA-
SOME IN WOUND HEALING IN GENETICALLY DIABETIC MICE OPENS NEW
PERSPECTIVES IN PLASTIC SURGERY**

Michele R. COLONNA, Francesco SQUADRITO, Ferdinando STAGNO D'ALCONTRES,
Domenica ALTAVILLA, Mariarosaria GALEANO, Francesco STAGNO D'ALCONTRES,
Alessandra BITTO, Messina, Italy

13.40 THE ROLE OF NADPH OXIDASES (NOX) IN WOUND HEALING

Dominik LÉVIGNE, Ali MODARRESSI, Karl-Heinz KRAUSE, Brigitte PITTET- CUÉ-
NOD, Geneva, Switzerland

**13.50 SKIN WOUND HEALING IN A RABBIT EAR MODEL ENHANCED BY IN-
TRALESIONAL INJECTION OF PLATELET RICH PLASMA**

Dimitrios DIONYSIOU, Eferpi DEMIRI, Pericles FOROGLUO, Leonidas PAVLIDES,
Georgia Alexandra SPYROPOULOU, Thessaloniki, Greece

**14.00 ISOLATION OF ANGIOGENIC FACTORS FROM HUMAN PERIPHERAL
BLOOD FOR THE DEVELOPMENT OF A BIOACTIVE DRESSING**

Arndt F. SCHILLING, E. HADJIPANAYI, A.T. BAUER, P. MOOG, H. KÜKREK, B. SAL-
GIN, L. BAUER, A. SCHLÜTER, M. NINKOVIC, H.G MACHENS, Munich, Germany

**14.10 CLINICAL APPLICATION OF MESENCHYMAL STEM CELLS ISOLATED
FROM LIPOASPIRATE FOR THE TREATMENT OF CHRONIC SKIN ULCERS**

Nicolò BERTOZZI, Eugenio GRIGNAFFINI, Michele GRIECO, Elena BOSCHI, Giorgia
CARUANA, Edoardo RAPOSIO, Parma, Italy

**14.20 THE ROLE OF ADSC'S IN IMPROVING THE RESOLUTION OF COMPLI-
CATED ULCERS**

Monica RUCCI, Luigi ANNACONTINI, Domenico PARISI, Michela CAMPANARO,
Aurelio PORTINCASA, Foggia, Italy

**14.30 LASER DOPPLER FLOWMETRY FOR THE ASSESSMENT OF ADSCS
TREATMENT EFFECTIVENESS IN CHRONIC CUTANEOUS ULCERS**

Nicolò BERTOZZI, Michele GRIECO, Eugenio GRIGNAFFINI, Elena BOSCHI, Giorgia
CARUANA, Edoardo RAPOSIO, Parma, Italy

14.40 SHORT-TERM DELIVERY OF FIBRIN-BOUND VEGF PROTEIN IN OSTEOGENIC GRAFTS: INCREASED VASCULARIZATION WITH EFFICIENT BONE FORMATION

Maximilian BURGER, Nunzia DI MAGGIO, René D.LARGO, Michael HEBERER, Ivan MARTIN, Arnaud SCHERBERICH, Dirk J. SCHAEFER, Andrea BANFI, Basel, Switzerland

14.50 BONE REGENERATIVE CAPACITY OF RHBMP-2 LOADED CARBOXYMETHYLCHITOSAN MICROSPHERES IN A RAT CALVARIAL DEFECT

Petros KONOFAOS, Dana PETERSEN, Joel BUMGARDNER, Robert WALLACE, Memphis, Tennessee, USA

15.00 ENGINEERING OF AXIALLY VASCULARIZED BONE GRAFTS FOR THE TREATMENT OF AVASCULAR BONE NECROSIS

Rik OSINGA, Laurent André TCHANG, Atanas TODOROV, Ivan MARTIN, Arnaud SCHERBERICH, Dirk Johannes SCHAEFER, Basel, Switzerland

15.10 REGENERATIVE BONE REPAIR – TRANSLATING A PLATFORM TECHNOLOGY TO THE OPERATION ROOM

Thilo SCHENCK, Martijn VAN GRIENSVEN, Rüdiger VON EISENHARDT- ROTHE, Dietmar HUTMACHER, Hans-Günther MACHENS, Jan-Thorsten SCHANTZ, Munich, Germany

15.20 End of Session

15.20-15.40 Coffee Break

15.40-17.00 SCIENTIFIC SESSION No. 4, CLINICAL APPLICATION

Session Chairpersons:

Fabrizio SCHONAUER, Naples, Italy

Eva PLACHETA, Vienna, Austria

15.40 OPEN TIBIA FRACTURES ARE BEST TREATED IN A PLASTIC- ORTHOPAEDIC SURGICAL MULTIDISCIPLINARY SETTING

Filippo BORIANI, Umraz KHAN, Ata Ul HAQ, Roberto URSO, Bologna, Italy

15.50 PILOT STUDY - INFLUENCE OF SEVERE THERMAL INJURY TO BONE METABOLISM 12-36 MONTHS AFTER TRAUMA IN ADULT PATIENTS

Elisabeth MAURER, Gabriela Katharina MUSCHITZ, Christian MUSCHITZ, Gerald IHRA, Heinrich RESCH, Thomas RATH, Vienna, Austria

16.00 “BONE-ANCHORED PENILE EPITHELSIS”: PRE-OPERATIVE PLANNING AND IMMEDIATE OUTCOME OF THE FIRST FIVE CASES

Gennaro SELVAGGI, Rickard BRÄNEMARK, Anna ELANDER, Mattias LIDEN, Joacim STALFORS, Gothenburg, Sweden

16.10 THE ANATOMICAL BASIS OF THE LUMBAR ARTERY PERFORATOR FLAP: A CADAVER AND COMPUTER TOMOGRAPHY ANGIOGRAM STUDY

Lorenzo CALÌ-CASSI, Gangadasu REDDY, Shai M. ROZEN, Maria MANI, Thorir AU-DOLFSSON, Andres RODRIGUEZ-LORENZO, Uppsala, Sweden

16.20 AN ANATOMICAL INVESTIGATION WITHOUT CADAVERS: HOW TO RECYCLE CT SCANS TO STUDY PERFORATOR ANATOMY IN THE ABDOMEN

Sebastiano OIENI, Claudia LIUZZA, Corrado REINA, Salvatore D'ARPA, Francesco MOSCHELLA, Palermo, Italy

16.30 NEW INSIGHTS INTO THE ARTERIAL SUPPLY OF THE UMBILICAL STALK AND SKIN

Christoph GRILL, Christina KLAWATSCH, Mircea-Constantin SORA, Rafic KUZBARI, Vienna, Austria

16.40 1-CM VERSUS 2-CM EXCISION MARGINS FOR PATIENTS WITH INTERMEDIATE THICKNESS MELANOMA

Salvatore GIORDANO, Ilkka KOSKIVUO, Esko VERÄJÄNKORVA, Pia VIHINEN, Turku, Finland

16.50 CUTANEOUS HIGH-FREQUENCY SONOGRAPHY IN THE EVALUATION OF MELANOMA THICKNESS AS A GUIDE FOR SENTINEL LYMPH NODE BIOPSY

Sergio MARLINO, Fabrizio SCHONAUER, Luigi CANTA, Massimiliano SCALVENZI, Mario DELFINO, Maria SCOTTO DI SANTOLO, Guido MOLEA, Naples, Italy

17.00 End of Session

17.00-17.50 SCIENTIFIC SESSION No. 5, TRAINING IN MICROSURGERY

Session Chairpersons:

Salvatore GIORDANO, Turku, Finland

Anne Therese LAUVRUD, Umeaa, Sweden

17.00 MICROSURGERY SIMULATION TRAINING - A NEW SYSTEM TO COMPLEMENT EVERY TRAINING PROGRAM

Dhalia MASUD, Nadine HACHACH-HARAM, Pari-Naz MOHANNA, London, United Kingdom

17.10 ALL TIED UP' - A TOOL FOR DEVELOPING MICROSURGICAL SKILLS

Whitney CHOW, Nadine HACHACH-HARAM, Mohammed TAHIR, Dhalia MASUD, Pari-Naz MOHANNA, London, United Kingdom

17.20 THE 'IN-OUT-UP-DOWN' TRAINING MODEL FOR THE DEVELOPMENT OF DEXTERITY AND VISUOSPATIAL SKILLS IN MICROSURGERY: A VALIDATION STUDY

Nadine HACHACH-HARAM, Dhalia MASUD, Saour SAMER, Pari-Naz MOHANNA,

London, United Kingdom

17.30 EFFECT OF COMPUTER GAMES AND MUSICAL INSTRUMENT ON MICROSURGERY

Margarita MOUSTAKI, Dhalia MASUD, Nadine HACHACH-HARAM, Pari-Naz MOHANNA, London, United Kingdom

17.40 End of Session

17.40-18.40 GENERAL ASSEMBLY

21.00 PIZZA PARTY

EURAPS Junior Working Group Gathering

THURSDAY. MAY 29, 2014

8.30-10.30 SCIENTIFIC SESSION No. 6, BREAST

Session Chairpersons:

Mario RIETJENS, Milan, Italy

Georg NOEVER, Zurich, Switzerland

8.30 SHOULD FREE NIPPLE-GRAFT TECHNIQUE BE HISTORY IN BREAST REDUCTION SURGERY?

Zeynep KARACOR ALTUNTAS, Mehmet DADACI, Bilsev INCE, Nedim SAVACI, Meram, Turkey

8.40 WHERE SHOULD WE PLACE THE NIPPLE AREOLAR COMPLEX IN SUPEROMEDIAL PEDICLE-INVERTED T SCAR REDUCTION MAMMOPLASTY TECHNIQUE?

Zeynep KARACOR ALTUNTAS, Haldun O. KAMBUROGLU, Nurten YAVUZ, Mehmet DADACI, Bilsev INCE, Konya, Turkey

8.50 CORRELATION BETWEEN NIPPLE ELEVATION AND BREAST RESECTION WEIGHT: HOW TO PREOPERATIVELY PLAN BREAST REDUCTION

Mariagrazia MOIO, Fabrizio SCHONAUER, Naples, Italy

9.00 NIPPLE SHIELDS AS ADDITIONAL TOOL TO POCKET IRRIGATION IN REDUCING CAPSULAR CONTRACTURE RATE AFTER COSMETIC BREAST AUGMENTATION

Salvatore GIORDANO, Asko SALMI, Turku, Finland

9.10 AUTOLOGOUS AUGMENTATION MASTOPEXY WITH ANTERIOR INTERCOSTAL ARTERY PERFORATOR (AICAP) FLAP: VOLUMETRIC EVALUATION BY MAGNETIC RESONANCE IMAGING (MRI)

Beniamino BRUNETTI, Stefania TENNA, Achille AVETA, Luca Alfonso PENDOLINO,

Paolo PERSICHETTI, Rome, Italy

9.20 OUTCOMES OF ACELLULAR DERMAL MATRIX FOR IMMEDIATE TISSUE EXPANDER RECONSTRUCTION WITH RADIOTHERAPY

Patrick GARVEY, Craig E. STIRLING, Mark CLEMENS, John KOSHY, James WREN, Jesse SELBER, Steven KRONOWITZ, Houston, Texas, USA

9.30 TEN-YEAR RESULTS FROM THE NATRELLE® 410 ANATOMICAL FORM STABLE SILICONE BREAST IMPLANT CORE STUDY

Francesca DE LORENZI, G. Patrick MAXWELL, Bruce W. VAN NATTA, Bradley P. BENTGTON, Diane K. MURPHY, South Nashville, Tennessee, USA

9.40 LYMPHATIC DRAINAGE PATTERN OF RECONSTRUCTED BREAST WITH LATISSIMUS DORSI FLAP

Rosaria LAPORTA, Benedetto LONGO, Michail SOROTOS, Marco PAGNONI, Fabio SANTANELLI DI POMPEO, Rome, Italy

9.50 TOTAL AUTOLOGOUS BREAST RECONSTRUCTION USING THORACODORSAL SYSTEM FLAPS: PRELIMINARY EXPERIENCE

Michail SOROTOS, Benedetto LONGO, Corrado RUBINO, Fabio SANTANELLI DI POMPEO, Rome, Italy

10.00 AUTOLOGOUS FAT GRAFTS TO DIFFERENT LAYERS IN THE BREAST: COMPARING SUBCUTANEOUS TO INTRAMUSCULAR GRAFTING IN INNERVATED AND DENERVATED MUSCLE TO OPTIMIZE FAT TAKE, QUALITY AND PERMANENCY IN RODENTS

Patricia Esther ENGELS, Elisabeth A. KAPPOS, Patricia Katharina SIEBER, Arne FISCHMANN, Dirk J. SCHAEFER, Daniel F. KALBERMATTEN, Basel, Switzerland

10.10 FURTHER OPTIMIZATION OF AUTOLOGEOUS BREAST RECONSTRUCTION USING THE FAST TRACK METHODOLOGY

Christian BONDE, Hoda KHORASANI, Jens ELBERG, Henrik KEHLET, Copenhagen, Denmark

10.20 End of Session

10.20-10.50 Coffee Break

10.50-11.50 SCIENTIFIC SESSION No. 7, FACE

Session Chairpersons:

Rosaria LAPORTA, Rome, Italy

Jan A. PLOCK, Zurich, Switzerland

10.50 SURGICAL TECHNIQUES IN CLOSED RHINOPLASTY OF A BIG, MASSIVE, BOXY OR BULBOUS NOSE

Sergei MOSHAK, Vladivostok, Russia

11.00 ORBITAL FLOOR FRACTURES RECONSTRUCTION UNDER LOCAL ANAESTHESIA

Tommaso AGOSTINI, Giuseppe SPINELLI, Florence, Italy

11.10 TWO-YEAR EVALUATION OF EITHER BILOBED FLAP OR FULL THICKNESS SKIN GRAFT AS A CLOSURE TECHNIQUE OF THE NASAL TIP

Marius A. KEMLER, Groningen, Netherlands

11.20 FREE RADIAL FOREARM FLAP VERSUS PECTORALIS MAJOR MIOCUTANEUS FLAP IN TONGUE RECONSTRUCTION: EVALUATION OF TONGUE RECOVERY

Pasquale GRAZIANO, Fabio ASTARITA, Alfonso ALBERICO, Fabrizio SCHONAUER, Giovanni DELLAVESANA ORABONA, Luigi CALIFANO, Naples, Italy

11.30 AN ALTERNATIVE AND PRACTICAL APPROACH TO HARVEST THE FACE AND SCALP ALLOGRAFT AS A SINGLE UNIT

Mehmet BOZKURT, Gaye FILINTE, Can OZTURK, Safak UYGUR, Cemile Nurdan OZTURK, Risal DJOHAN, Maria SIEMIONOW, Istanbul, Turkey

11.40 FUNCTIONAL AND ANATOMICAL BASIS FOR BRAIN PLASTICITY IN FACIAL PALSY REHABILITATION USING THE MASSETERIC NERVE

Javier BUENDIA, Diego MARRE, Alvaro CABELLO, Ismael GONZALEZ, Cristina AUBA, Federico VILLAGRA, Francis LOAYZA, Maria Asuncion PASTOR, Bernardo HONTANILLA, Pamplona, Spain

11.50 End of Session

12.00 ADJOURNMENT OF THE MEETING

14.00 25th ANNUAL EURAPS MEETING

ABSTRACTS

8.20 THE EFFECT OF SHEAR STRESS IN AUTOLOGOUS FAT GRAFTING

Nadia MENZI, Rik OSINGA, Laurent André Hong TCHANG, Daniel CAVIEZEL, Arnaud SCHERBERICH, Dirk Johannes SCHAEFER, Renè Denis LARGO, Basel Switzerland

Background

Autologous fat grafting has become a popular technique for reconstructive and aesthetic purposes. A major drawback of this technique includes the limited predictability of the engraftment rate and the long-term outcome. Various methods and protocols to harvest, process, and inject the fat grafts have been described, with presently no defined gold standard. The mechanical repercussions of pressure and shear have been highlighted recently. This study analyzed the effects of shear stress upon fat grafts with regard to viability, clonogenicity, multilineage differentiation and morphology.

Materials and Methods

Abdominal liposuction was performed in 5 patients. The harvested fat was centrifuged for 3 minutes at 1500rpm. The fat was either not shifted (group1), shifted 5 times (group2) or 30 times (group3) between two 10-cc syringes connected to each other. The lipoaspirate of all three groups was applied through a 1mm cannula as it is done in lipoinjection. The analysis was both performed before and after applying the lipoaspirate through the 1mm cannula. Viability was assessed by propidium iodide staining, clonogenicity by CFU-f, adipogenic and osteogenic differentiation with respective media. Morphology was assessed through immunofluorescence staining with Bodipy 558/568 for adipocytes, Isolectin for endothelial cells and Hoechst for nuclei.

Results

The more shear stress applied on the lipoaspirate, the lower the viability. In parallel, morphologic changes were observed. The number, diameter and branching of vessels were diminished as was the total cell number per optical field. Shear stress did not reduce the clonogenicity and multilineage differentiation potential of the surviving cells.

Conclusions

Shear stress applied on the lipoaspirate both during shifting between cannulas and during application through the 1mm cannula influences viability and morphology. Clonogenicity and multilineage potential of the surviving cells do not seem to be diminished.

8.30 STROMALVASCULAR CELL COMPOSITION OF THE LOW AND HIGH DENSITY FRACTIONS OF CENTRIFUGATED LIPOASPIRATE

Alessio CAGGIATI, Antonia GERMANI, Mario PICOZZA, A. DI CARLO, Rome, Italy

Background

Lipostructure, also defined lipofilling or fat grafting, is actually indicated for filling or regenerative purposes. The main limitation is the unpredictable graft retention probably as results of ischemia and lack of neoangiogenesis of the transplanted tissue. Due their differentiation ability and paracrine action, adipose tissue derived stem cells (ASC) present in the stromal vascular fraction (SVF), may have a role in the persistence of grafted fat. Lipoaspirate are normally obtained through low pressure liposuction and adipose tissue centrifugation which allow to obtain adipose tissue fractions distributed along a gradient density. We hypothesize that a different SVF composition in the low and high density fat may affect fat grafting.

The aim of this study is to evaluate cellular composition of the SVF in the low and high density adipose tissue

Materials and Methods

Sample of human lipoaspirates (10 cc) were centrifuged for 3 minutes at 1000 rpm. Plasma and the free oil were discarded while the low and high density fat was subjected to collagenase digestion. After 1 hr, samples were centrifuged in order to obtain the SVF and analyzed by flow cytometry.

Results

A cell population expressing mesenchymal stem cell markers is present both in the low and high density fractions, slightly increasing in the low density fractions. In contrast, high density fractions contain more fibroblasts and pericytes while endothelial cells are equally present in both fractions.

Conclusions

The SVF obtained from low and high density fractions of lipoaspirate seems to have different cell composition. Studies are ongoing to confirm these results and to evaluate whether this result may influence lipoaspirate persistence in grafted tissue.

8.40 FAT GRAFTING AND ADIPOSE STEM CELLS: EVALUATION OF DIFFERENT TECHNIQUES

Sarah CALABRESE, Rossana DOMENIS, Daniela CESSSELLI, Lara LAZZARO, Fabrizio DE BLASIO, Daria ALMESBERGER, Chiara ZANIN, Pier Camillo PARODI, Udine, Italy

Background

Lipostructure is a widespread technique in many fields of Plastic Aesthetic and Reconstructive Surgery. The extremely variable resorption rate of adipose tissue is a limit to the success of the technique and often many surgical procedures are required to obtain an adequate and stable result.

Theories about the role of Adipose Stem Cells (ASCs) on fat graft survival rate have driven the development of different techniques and devices to reach a more reliable outcome.

Materials & Methods

We enrolled in the study n=36 patients which underwent mammary reconstruction by different lipostructure techniques from January 2010 to January 2012. Lipoaspirates were analysed from each patient, and in those patients that were subsequently treated with stem cell-enrichment, two samples have been isolated both the not-enriched and the stem cell-enriched samples, thus having the opportunity to directly compare the effect of the enrichment procedure. Immunophenotype in P0 and P3, clonogenicity, expression of markers, kinetic expansion, characteristics of differentiation were studied.

From the clinical point of view, a dedicated team has conducted ultrasound evaluations in the pre-operative period and postoperatively at 6 and 12 months, to establish the gain in subcutaneous tissue and its stability through time.

Results

Our results indicate that ASCs are present and maintain their histological features as mesenchymal stem cells at P3. The techniques investigated have shown statistically significant differences in yield rates and in gain of subcutaneous tissue ($p=0.002$ for the superior-medial quadrant and $p=0.028$ for the central quadrant by Kruskal-Wallis test).

Conclusions

Histological findings show that all the samples evaluated retain properties of adult multipotent stem cells. Cell yield rates and preliminary clinical data are prone to confirm better results with the use of stem cell-enriched fat graft. These data have to be compared with long-term results and cost analysis evaluation.

8.50 CHARACTERISATION OF HUMAN ADIPOSE TISSUE DERIVED STEM CELLS WITH ENHANCED ANGIOGENIC AND ADIPOGENIC PROPERTIES

Anne Therese LAUVRUD, Mikeal WIBERG, Paul KINGHAM, Umeaa, Sweden

Background:

Autologous fat grafting is a popular method for soft tissue reconstructions. However, the success of such procedures relies on the graft surviving until a sufficient quantity of new blood vessels have revascularised the tissue. Survival can be improved by supplementing the fat graft with a stromal vascular fraction cell mix or isolated adipose tissue derived stem cells (ASC). With a view to identifying an optimal cell type for transplantation we have evaluated the angiogenic and adipogenic properties of CD146+ cells isolated from cultured ASC.

Materials & Methods

Human abdominal fat (n = 6 female patients, mean age = 50 ± 1.2 years) was treated with collagenase type I followed by centrifugation to pellet the ASC which were then plated onto tissue culture plastic. The adherent cells at passages 1-2 were immunoselected for the CD146 surface antigen using a Miltenyi Biotec microbead kit.

Results

The mean yield of CD146+ cells was $18.16 \pm 3.67\%$. Both CD146- and CD146+ cells expressed CD90 and alpha smooth muscle actin protein and were negative for CD31 and CD34. The CD146+ cells expressed more NG2 protein, consistent with an overall phenotype characteristic of pericytes. qRT-PCR and ELISA showed that CD146+ cells expressed higher levels of a number of angiogenic molecules including angiopoietin-1, FGF-1 and VEGF-A. Conditioned medium taken from CD146+ cells significantly increased formation of in vitro endothelial cell tube networks whereas CD146- cells did not. Treatment of both CD146- and CD146+ cells with adipogenic differentiating medium resulted in formation of Oil Red O positive cells. After 3 weeks of treatment, CD146+ cells showed higher expression of adiponectin, a marker of mature adipocytes.

Conclusions

These results suggest that CD146+ cells selected from a heterogeneous mix of ASC have more favourable angiogenic and adipogenic properties, which might provide significant benefits for reconstructive and plastic surgery.

9.00 IMPACT OF LIDOCAINE AND ADRENALINE ON SURVIVAL AND PROLIFERATION OF HUMAN ADIPOSE-DERIVED STROMAL/PROGENITOR CELLS

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Background

Increasing evidence suggests that the success of autologous fat graft transplantations depends on the survival and the preservation of the proliferation capacity of adipose-derived stromal/progenitor cells (ASC). Local anaesthetics and haemostatic substances may have detrimental side effects on ASC, which could contribute to reduced fat engraftment. Lidocaine and adrenaline are commonly used as anaesthetic or haemostatic agents in liposuctions. The impact of these substances on ASC is not completely understood.

Material and Methods

In the present study we analyzed dose-dependent effects of lidocaine and adrenaline on viability and proliferation of a defined DLK1 (PREF1) +/- CD105+/- CD90+/- CD34+/- CD31- ASC population gently isolated from human subcutaneous adipose tissue of the lower abdomen obtained from women undergoing elective plastic abdominal surgery.

Results

We found that lidocaine in concentrations used in standard clinical practice had no deleterious effects neither on survival nor on proliferation on the ASCs. At higher concentrations lidocaine significantly reduced ASC survival and proliferation. Adrenaline when used in standard clinical concentrations showed no effects on survival and proliferation of ASCs. Moreover, adrenaline could not protect ASCs against the detrimental effects of higher concentrations of lidocaine. We found however that adrenaline when solely administered at considerably higher dose improved viability and proliferation of the adipocyte progenitors.

Conclusions

In conclusion our study suggests that lidocaine and adrenaline in concentrations used in standard clinical practice are neutral regarding viability and proliferation of gently prepared human ASC. Adrenaline used at higher concentration could protect ASCs, stimulate their proliferation and, hence, increase the number of viable ASCs.

9.10 ADIPOSE DERIVED PERIVASCULAR STEM CELLS ARE A SOURCE OF PURIFIED AUTOLOGOUS MESENCHYMAL STEM CELLS FOR REGENERATIVE MEDICINE - IS THE NEED FOR EX-VIVO CULTURE OVER?

Christopher C. WEST, Iain R. MURRAY, W. Reef HARDY, Xinli ZHANG, Aaron JAMES, Ken STEWART, Kang TING, Chia SOO, Bruno PÉAULT, Edinburgh, United Kingdom

Background

Adipose tissue is an attractive source of mesenchymal stem cells (MSCs) as it is largely dispensable and readily accessible through minimally invasive procedures such as liposuction. Until recently MSCs could only be isolated in a process involving ex-vivo culture. Pericytes (CD45-, CD146+, and CD34-) and adventitial cells (CD45-, CD146-, CD34+) represent two populations of MSCs (collectively termed perivascular stem cells or PSCs) that can be prospectively purified using fluorescence activated cell sorting (FACS).

Material and Methods

Within this study we analyse the adipose tissue of n=129 donors using flow cytometry to determine the frequency of PSCs and correlate this with demographic and processing data such as age, sex, BMI and cold storage time of the tissue.

Results

The mean number of stromal vascular fraction (SVF) cells from 100ml of lipoaspirate was 37.8 million. Within the SVF, mean cell viability was 82%, with 31.6% of cells being hematopoietic (CD45+). Adventitial cells and pericytes represented 31.6% and 7.9% of SVF cells respectively. Therefore, a 200ml lipoaspirate would theoretically yield 24.5 million prospectively purified PSC - sufficient for many reconstructive and regenerative applications. Minimal changes were observed in respect to age, sex and BMI suggesting universal potential application. PSCs expanded and cultured in-vitro demonstrated MSC marker expression (CD90 and CD105) by flow cytometry. We confirmed the ability of these cells to function as MSC by demonstrating osteogenic and adipogenic differentiation in-vitro.

Conclusions

Our study confirms that pure populations of MSC-pre-cursors (PSCs) can be prospectively isolated from adipose tissue, in sufficient quantities to negate the necessity for expansion in culture before transplantation. This reduces delays associated with expansion and may prevent exposure of patients to repeated anaesthetics while widening possible applications to include trauma where such delays may have previously excluded their use.

9.20 IN VIVO EFFECTS OF AUTOLOGOUS FAT GRAFTING: A REFINED EXPERIMENTAL MODEL

Erica DALLA VENEZIA, Alice BARONCINI, Vincenzo VINDIGNI, Franco BASSETTO, Giorgio BASSETTO, Padua, Italy

Background

adipose tissue grafting represents a widely used technique in plastic surgery, since it is mini-invasive and very adaptable. The lack of a suitable animal experimental model does not allow a clear understanding of the behavior of grafted fat in vivo. Aim of this study is to refine an experimental model to evaluate the effects of grafted adipose tissue in both physiologic and pathologic conditions.

Materials and methods

we refined a previous experimental model adopting white new zealand rabbits. Fat was harvested from the proximal dorsal region of each animal and subsequent autologous grafting was performed in the same surgical procedure after fat processing according to Coleman's technique. Lipoaspirate was injected in subcutaneous area beneath intact skin and beneath a full-thickness, sutured skin lesion. As control, saline solution was injected both beneath intact skin and beneath another full-thickness lesion. All animals were euthanized 30 days after surgery, the obtained samples were analyzed histologically to assess the thickness of the dermal layer (H&E) and with CD31 immuno-histo-chemical staining in order to count the dermal vessels.

Results

in the experimental study we observed that, one month after surgery, the volume of grafted adipose tissue graft was mostly preserved in the recipient tissue and it was surrounded by a mild to absent inflammatory infiltrate. The samples of intact skin treated with adipose tissue grafting showed a significant increase in dermis thickness and number of vessels when compared to the samples infiltrated with saline solution.

Conclusions

The histologic changes, in particular the durable presence of the graft, the induction of a mild inflammatory reaction and the effects on dermis thickness and number of vessels, account for these outcomes. Nonetheless more studies are needed to investigate additional biological mechanisms.

9.30 HISTOPATHOLOGIC AND MOLECULAR EFFECTS OF ADIPOSE DERIVED STEM CELLS ON RABBIT EAR HYPERTROPHIC SCAR MODEL

Bora Edim AKALIN, Bülent SAÇAK, Ceyda CÖREK, Betül ÇATALGÖL, Özlem Tuğçe ÇILINGIR, Feriha ERCAN, Istanbul, Turkey

Background

The aim of this study is to compare adipose derived stem cell (ADSC) treatment with steroid treatment on rabbit ear hypertrophic scar model and analyze results of hypertrophic scar index, protein amount of EGF, EGFR, IGF, FGF, PDGF and actin.

Material & Methods

Hypertrophic scar model is produced on 18 male New Zealand rabbits that are randomly separated to 4 groups: Group 1: Sham, Group 2: PBS, Group 3: Steroid, Group 4: Stem cell. Except sham group, each group received intralesional injection of PBS, triamcinolone, and autologous ADSC solution. At day 40 hypertrophic scar index was measured at one part of the scars and the other part of the scars were used for western blot analyze. Statistical analyze is made with one way ANOVA test and p value less than 0,05 is considered significant.

Results

Compared with sham and PBS groups, steroid and stem cell groups had lower hypertrophic scar index, higher EGF, EGFR and PDGF, and lower actin.

Conclusions

Our results indicate that hypertrophic scar treatment with ADSCs has similar results with intralesional steroid therapy on rabbit ear model. Decrease in actin levels indicates possible improvement after scar contracture treatment with ADSCs. Protein analyses indicate that keratinocytes are important for a signal that stop proliferation phase of wound healing and increase breakdown of collagen, however further studies are needed to clarify this signal.

9.40 GENE THERAPY IN REGENERATIVE SURGERY

Giorgio GIATSIDIS, Erica DALLA VENEZIA, Franco BASSETTO, Padua, Italy

Background

In the past two decades, regenerative surgeons have focused increasing attention on the potential of gene therapy for treatment of local disorders and injuries. Since gene transfer techniques may provide an effective local and short-term induction of growth factors without the limits of other topical therapies they may represent innovative and valid adjuvant regenerative procedures.

Material and Methods

Literature indexed in the National Center for Biotechnology Information database (PubMed) has been reviewed using variable combinations of keywords ("gene therapy," "regenerative medicine," "tissue regeneration," and "gene medicine"). Articles investigating the association between gene therapies and local pathologic conditions have been considered. Further literature has been obtained by analysis of references listed in reviewed articles.

Results

Gene therapy approaches have been successfully adopted in preclinical models for treatment of a large variety of local diseases affecting almost every type of tissue. Experiences in abnormalities involving skin (e.g., chronic wounds, burn injuries, pathologic scars), bone, cartilage, endothelia, and nerves have been reviewed. In addition, the supporting role of gene therapies to other tissue-engineering approaches has been discussed. Despite initial reports, clinical evidence has been provided only for treatment of diabetic ulcers, rheumatoid arthritis, and osteoarthritis.

Conclusions

Translation of gene therapy strategies into human clinical trials is still a lengthy, difficult, and expensive process. Even so, cutting-edge gene therapy-based strategies in reconstructive procedures could soon set valuable milestones for development of efficient treatments in a growing number of local diseases and injuries.

9.50 THE WHITE ADIPOSE TISSUE USED IN LIPOTRANSFER PROCEDURES IS A RICH RESERVOIR OF CD34+ PROGENITORS ABLE TO PROMOTE CANCER PROGRESSION

Mario RIETJENS, Francesca DE LORENZI, Francesco BETOLINI, Ines MARTIN-PADURA, Jean Yves PETIT, Milan, Italy

Background

Previous studies have suggested a catalytic role in neoplastic angiogenesis and cancer progression for bone marrow-derived endothelial progenitor cells (EPCs). However, pre-clinical and clinical studies have shown that the quantitative role of marrow-derived EPCs in cancer vascularization is extremely variable.

Material and Methods

We have found that human and murine white adipose tissue (WAT) is a very rich reservoir of CD45-CD34+ EPCs with endothelial differentiation potential, containing a mean of 263 times more CD45-CD34+ cells/ml than bone marrow.

Results

Compared to marrow-derived CD34+ cells mobilized in blood by G-CSF, purified WAT-CD34+ cells expressed similar levels of stemness-related genes, significantly increased levels of angiogenesis-related genes and increased levels of FAP-alpha, a crucial suppressor of anti-tumoral immunity. In vitro, WAT-CD34+ cells generated mature endothelial cells and capillary tubes as efficiently as mature mesenchymal cells. The co-injection of human WAT-CD34+ cells from lipotransfer procedures contributed to tumor vascularization and significantly increase tumor growth and metastases in several orthotopic models of human breast cancer in immunodeficient mice. Endothelial cells derived from human WAT-CD34+ cells lined the lumen of cancer vessels.

Conclusions

These data indicate that CD34+ WAT cells can promote cancer progression and metastases. Our results highlight the importance of gaining a better understanding of the role of different WAT-derived cells used in lipotransfer for breast reconstruction in patients with breast cancer.

10.20 INNERVATION OF PREFABRICATED FLAP: A NEW EXPERIMENTAL MODEL

Giuseppe CUCCIA, Marco ROMEO, Shan Shan QIU, Bernardo HONTANILLA, Stefano GEUNA, Palermo, Italy

Background

Neoangiogenesis in bioengineered-prefabricated flaps was successfully developed in previous studies. Beside neoangiogenesis, flap innervation by neo-axo genesis is also very important for flap survival and function. In this study, the authors evaluated the innervation rate of a prefabricated flap using acellular collagen matrix as scaffold and present the first report of innervation of prefabricated flap with a flow-trough model.

Materials and Methods

16 Sprague–Dawley rats were operated on both limbs. Two sheets of collagen matrix (Integra®) were implanted around the neurovascular femoral bundle as in vivo flow-through flap model, using the proximal and distal nerve stumps. After one month of observation, they were randomly divided into two groups: the first group had the femoral nerve carefully dissected out of the flap; the second group had the femoral nerve left intact inside the flap; all rats had the contralateral nerve cut and studied as control. Specimens were studied with optical, electron microscopy and immunofluorescence to study Schwann and glial cells colonization, axonal growth rate and direction. Axonal count and density were performed and statistically evaluated.

Results

Qualitative structural and ultrastructural evaluation shown high level of integration, with axonal fibers merged within the collagen matrix throughout its thickness along with a newly formed vascular network. Ordinated Schwann cells colonization was recorded; Wallerian degeneration occurred inside the distal chamber.

Axonal count and density did not show statistically significant differences between the nerve inside the proximal flap and controls.

Conclusions

Innervation of the artificial flap can be obtained by implanting a nerve stump directly in the collagen matrix of prefabricated flap. The flow-through system was relatively easy to built and reliable to provide adequate blood supply. The collagen flap may be a suitable model promising for further studies based on microsurgical flaps.

10.30 AUTOLOGOUS NERVE FRAGMENTS IMPLANTED AROUND DISTAL PERIPHERAL NERVE SUTURES ENHANCE NERVE REGENERATION.

Giovanni ZABBIA, Alessio MARIOLO, Grazia SALIMBENI, Carla CANNIZZARO, Anna MAROTRANA, Fulvio PLESCIA, Adriana CORDOVA, Salvatore D'ARPA, Francesco MOSCHELLA, Palermo, Italy

Background

The aim of this study was to assess the effectiveness of seeding the distal suture of a nerve graft with fragments of a peripheral nerve in enhancing peripheral nerve regeneration.

Material and Methods

on 20 rats a 15mm sciatic nerve defect was reconstructed with a nerve graft. In the study group (10 rats) a 1mm nerve segment was minced and seeded around the distal nerve suture. Nothing was done in the control group (10 rats). The rats in each group were sacrificed at 4 (n= 5) and 12 weeks(n= 5). Number of regenerated fibers, fiber area and fiber density were assessed. The soleus and gastrocnemius muscles were harvested and weighed. In the 12 weeks group walking track analysis with open field test was performed. The Student t-test was used for statistical analysis.

Results

at 4 and 12 weeks the study group had a significantly ($p= 0,042$ and 0.032) higher number of axons (235 vs 160 and 378 vs 306) and fiber area ($561 \mu\text{m}^2$ vs $405 \mu\text{m}^2$ and $883 \mu\text{m}^2$ vs $661 \mu\text{m}^2$, $p= 0,043$ and 0.033) and the 12 weeks soleus muscle weight ratio was significantly higher ($0,72$ vs $0,40$, $p= 0.0207$). The gastrocnemius muscle weight ratio and walking track analysis differences were not significant.

Conclusions

Seeding the distal nerve suture with nerve fragments improves nerve regeneration by increasing number of regenerated axons, fiber area and the soleus muscle weight ratio. The lack of significant differences in the gastrocnemius muscle might be related to different response to denervation, while walking track analysis only measured the distance covered and not the quality of gait, thus compensation by the other limbs has masqueraded differences. The underlying mechanisms are still unclear but the technique seems promising and deserves further investigation.

10.40 A NEW POSSIBILITY TO FILL UP PERIPHERAL NERVE GAPS UP TO 2 CM USING A JALURONIC ACID TUBES: AN EXPERIMENTAL STUDY

Luigi ANNACONTINI, Monica RUCCI, Domenico PARISI, Luigi CAGIANO, Antonio IANNELLI, Aurelio PORTINCASA, Foggia, Italy

Background

Peripheral nerve lesions caused by car accident, working and domestic injuries are very common. The result is a loss of function (sensitive and motor) characterized by distal wallerian degeneration associated to the proximal nerve regeneration. Authors present a new nerve growing chamber made of hyaluronic acid for fixing these lesions, when up to 2 cm.

Materials and Methods

November 2011-January 2012: 15 Wistar studied, mean weight 180gr. On each rat an inverted autologous sciatic nerve graft (control) on one leg and a hyaluronic acid hollow tube on the other leg (study) were used to repair defects up to 2 cm. Prolene 9/0 was used for the epineural suture. At 7, 30 e 60 days motor function was evaluated and objectified through a grading scale (poor-moderate-good-complete), elaborated by us. Morphological (E/E) and immunohistochemical (s-100) studies were carried out by our pathologists.

Results

Techniques used for nerve repair up to 2cm were: autologous nerve grafting and tubulization using a new jaluronic acid tubes. Hyaluronic acid tubes recreate an optimal growing environment that allows an appreciable nerve regeneration working with a "simple to use" technique both for novices and specialists, with a "ready to use" device, eliminating donor site morbidity in presence of small nerve defect, using a totally bio-compatible material which is gradually degraded and completely absorbed by the body, avoiding any nerve compression.

Conclusions

This new device is a valid option for nerve lesions up to 2cm in length. This simple and effective technique can be reproduced in a short time by everyone, with satisfactory results if compared with more widely used tubes, reducing costs (hospital stay, cost of the device, elimination of autologous nerve harvesting) for each patient with a better compliance.

10.50 COLLAGEN (NEURAGEN®) NERVE CONDUITS AND STEM CELLS FOR PERIPHERAL NERVE GAP REPAIR

Pietro DI SUMMA, Paul KINGHAM, Corrado CAMPISI, Wassim RAFFOUL, Daniel KALBERMATTEN, Lausanne, Switzerland

Background

Traumatic nerve injuries often require a graft to bridge the gap. Collagen nerve guides can be used in clinical practice, but their use is generally limited to lesions up to 3 cm. Autologous cell transplantation may be an alternative strategy to support regeneration over longer gaps. We coupled FDA-approved collagen conduits to regenerative cells and investigated initial effects on nerve regeneration.

Materials and Methods

In vitro tests showing satisfactory cell retaining into collagen conduits (NeuraGen® nerve guides) and electronic microscopy analysis of cell adherence were performed. In the in vivo experiment, three groups (n=5 each) of NeuraGen® nerve guides were seeded with various cell types: primary Schwann cells (SC), SC-like differentiated mesenchymal and adipose-derived stem cells (dMSC, dASC). A control group was formed respectively by empty NeuraGen® guides. Conduits were used to cross a 1-cm rat sciatic nerve gap in a 2-weeks experiment. Immunohistochemical analysis on frozen longitudinal sections was performed to assess axonal regeneration and Schwann cell infiltration.

Results

Primary Schwann cells showed significant improvement in distal stump sprouting, without significant differences in proximal regeneration distances among experimental groups. dMSC and dASC-loaded conduits showed a diffuse sprouting pattern, while primary Schwann cells showed an enhanced cone pattern and a typical sprouting along the conduits walls, suggesting an increased affinity for the collagen type I fibrillar structure.

Conclusions

This work shows the high affinity of regenerative cells for collagen nerve guides, which can be used as efficient vehicle for cell delivery in tissue engineering applications. However, data suggest that a good cell retaining is not always associated with effective cell function, as the different types of cells did not have a significant effect on proximal nerve regeneration. The commercially available nerve guide could be modified in future tissue-engineering applications (e.g. extracellular matrix peptides) to better exploit cell potential.

11.00 PERIPHERAL NERVE REPAIR: MULTIMODAL COMPARISON OF REGENERATIVE POTENTIAL OF ADIPOSE DERIVED CELLS IN A BIODEGRADABLE CONDUIT

Elisabeth Artemis KAPPOS, Patricia Esther ENGELS, Moritz MEYER ZU SCHWABEDISSEN, Mathias TREMP, Stefanie VON FELTEN, Arne FISCHMANN, Arnaud SCHERBERICH, Dirk SCHAEFER, Daniel KALBERMATTEN, Basel, Switzerland

Background

Tissue engineering is a popular topic in peripheral nerve repair. Combining a nerve conduit with supporting cells appears to offer an opportunity for improved clinical outcomes, which have been poor to date. The aim of this study was to provide a broad overview over the most interesting and promising transplantable cells under equal experimental conditions over a long term period.

Material and Methods

1 Mio. of each of the following cell types were introduced into biodegradable fibrin conduits: rat adipose-derived stem cells (rASCs), Schwann cell (SC)-like differentiated rASC (drASC), rat SCs (rSCs), human (h-)ASCs from the superficial and deep abdominal layer as well as human stromal vascular fraction (SVF). The sciatic nerve injury model was used creating a 10mm gap in the left nerve of female Sprague Dawley rats (7 groups of 7 animals, 8 weeks old) and was bridged through this conduit. As a control we re-sutured a 10mm cut nerve segment backwards as an autograft. Long-term evaluation was carried out after 12 weeks in a multimodal manner comprising walking track and morphometric, as well as MRI analysis. The Sciatic Function Index (SFI) was calculated with the help of a functional evaluation tool. Moreover, cross sections of the nerve proximal, distal and in between the two sutures, corresponding to the former gap, were analysed. Furthermore gastrocnemius muscle weights between groups were compared and in addition imaging analysis (MRI) was performed.

Results

MRI revealed muscle atrophy across all groups and proved biodegradation of the fibrin conduit. Correlating trends throughout the different evaluation techniques could be shown: Superficial human ASC supported regeneration better than deep, in line with published in vitro data. SC-like drASC had the best regeneration potential when compared to the other adipose tissue derived cells.

Conclusions

We compared the most interesting transplantable cells in peripheral nerve repair, analysing them in a multimodal manner comprising functional and morphometric, as well as MRI analysis. In conclusion, particularly differentiated ASCs could be a clinically transplantable route towards new methods to enhance peripheral nerve repair.

11.10 ACELLULAR NERVE ALLOGRAFTS FOR PERIPHERAL NERVE DEFECTS BRIDGING: AN INNOVATIVE DECELLULARIZATION METHOD

Filippo BORIANI, Nicola FAZIO, Caterina FOTIA, Nicoletta ZINI, Nicola BALDINI, Bologna, Italy

Background

For unrepairable nerve defects, to date autogenous nerves are considered the golden standard, but donor site morbidity, limited availability and operation time prolongation are relevant problem. Acellular nerves from cadaveric donor, introduced longer than one decade ago, represent a novel promising alternative to bridge unrepairable nerve gaps. Aim of this study isto provide and evaluate a new method to decellularize cadaver nerve allografts.

The innovative nerve decellularization process will allow to produce the tissue in only one clean room working session of 5 hours (to date the standard process takes about 12 days), strongly reducing the manufacturing costs and allowing their distribution to public at a low price.

Material and Methods

Several methods to examine the effect of detergents on nerve tissue morphology and protein composition have been previously reported. Most of them are too expensive and time consuming. The novel decellularization technique is a modification of the Michigan detergent-based organic material removal, to speed up myelin and cellular debris detachment. The previously published Hudson's method has been chosen as control of the decellularization process. To validate the new nerve decellularization method, in terms of histological characteristics, outcomes were estimated through morphological and immunohistochemical studies.

Results

Histological analysis of processed acellular nerve have been performed to evaluate the preservation of the structure and almost complete clearance of donor cells and cellular debris. Immunostaining analysis confirmed absence of Schwann cells and the maintenance of basal lamina.

Conslusions

First results obtained by morphological analysis and immunofluorescence experiments indicate that the internal structure of native nerve is maintained. It is then possible to decellularize nerves with the novel technique reducing both manufacturing times and costs.

11.20 ADIPOSE-DERIVED STEM CELLS ENHANCE AXONAL REGENERATION THROUGH CROSS-FACE NERVE GRAFT

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Background

Cross-face nerve grafting (CFNG) combined with functional muscle transplantation has become the standard in reconstructing an emotionally controlled smile in complete irreversible facial palsy. However, the efficacy of a CFNG depends on the ability of regenerating axons to breach two nerve coaptations and reinnervate endplates in denervated muscle. The current study tested the hypothesis that adipose-derived stem cells (ADSC) would enhance axonal regeneration through a CFNG, and thereby enhance recovery of the facial nerve functions.

Material and Methods

21 Sprague-Dawley male rats underwent transection of the left buccal branch of the facial nerve, and a cross-face nerve grafting using the sciatic nerve as an interpositional graft, with coaptations to the ipsilateral and contralateral buccal branches, was carried out. Rats were divided into three groups: a non-grafted control group (Group I, n = 7), a grafted but non-treated control group (Group II, n=7), and a grafted and ADSC treated group (Group III, n=7). Assessments included biometric analysis of vibrissae movements, electrophysiology, immunohistochemical analysis of motor endplates for acetylcholine quantification, histologic assessment of facial muscles, and axonal numbers in the graft.

Results

The data from the biometric analysis of vibrissae movements, the electrophysiological assessment, endplate quantification, and histologic assessment of the muscle and the graft suggested that adipose-derived stem cells significantly enhanced axonal regeneration through CFNG.

Conclusions

These observations suggest that adipose-derived stem cells could be a clinically translatable route towards new methods to enhance recovery after cross-facial nerve grafting.

11.30 THE USE OF ELECTRON MICROSCOPY TO STUDY SERIAL SECTIONS OF AXONAL REGENERATION IN THE FACIAL NERVE.

Jonathan LECKENBY, Richard SCHALEK, Seymor KNOWLES-BARLEY, Jeff W. LICHTMAN, Adriaan GROBBELAAR, Cambridge, Massachussets, USA

Background

Many methods exist which allow the regenerating nerve to be studied in detail. Fluorescent confocal microscopy combined with transgenic lines of animals allows axons and neuromuscular junctions to be examined closely, particularly in combination with immuno-fluorescent antibody labeling. However, even with subset transgenic lines, the fluorescent images generated are unclear and accurate reconstructions are almost impossible.

A novel application of serial section imaging using electron microscopy is presented which allows each axon to be traced in detail previously not obtained.

Material and Methods

Two groups of wild-type mice were used: 1) Direct Nerve Repairs and 2) Nerve Grafts. In both groups axonal counts were made at the following points: within the normal posterior auricular nerve, after the repair and within the nerve graft. A Magellan™ 400L scanning electron microscope was used to image serial sections with RhoANA™ software to automatically annotate axons.

Results

Axon counts were significant reduced after a direct nerve repair was performed. Within the nerve graft group, axon counts were significantly reduced within the graft and again after the graft. 3-D reconstruction in the direct nerve repair groups was used to show how axons behave as they regenerate across a neurorrhaphy showing the chaotic nature involved with finding a pathway through the repair.

Conclusions

Using electron microscopy to serially image sections of a nerve sample allows us to examine the behaviour of individual axons in unprecedented detail. It is possible to reconstruct the process of an axon regenerating in 3-D using principles learned from 'connectomics' to try and understand which factors improve the chances an axon has at crossing a neurorrhaphy. The information is translatable to other areas of clinical medicine such as brachial plexus surgery and functional muscle transfer. This technique provides an automated analysis of nerve regeneration that is fast and cost effective to implement.

11.40 MRI MONITORING IN NERVE ROOT COMPRESSION TREATED BY REGENERATIVE CELLS

Patricia K. SIEBER, Elisabeth A. KAPPOS, Patricia E. ENGELS, Robyn M. BENZ, Arne FISCHMANN, Dirk J. SCHAEFER, Stefan SCHAEAREN, Daniel F. KALBERMATTEN, Basel, Switzerland

Background

An important factor causing low back pain and lumbar radiculopathy is the acute or chronic compression of the dorsal root ganglion or its near nerve roots by different traumatic mechanisms. The high disease burden, compounded by the absence of reliable effective treatments, gave us a new impetus to be looking for therapeutically alternatives. Since epidural steroid injections are well established, it would be our aim to modify this form of local application and to inject adipose derived stem cells (ASCs) epineurally. We would like to find out whether promising results like those which could be achieved with the help of ASCs in peripheral nerve repair after transection are applicable to this crush injury model in rats. By using special non-metallic clips the monitoring of nerve regeneration by MRI becomes possible.

Material and Methods

In female Sprague Dawley rats (6 groups of 7 rats, 8 weeks old), different nerve crush injuries (squeeze over 1mm or 10mm for 60s respectively constant compression with non-metallic clips) will be carried out approximately 1cm distally to the spine. Depending on the group, either 500000 ASC in 25 μ l or the same volume of growth medium will be injected in the epineurium exactly there where the squeezing took place. The assessments include a weekly calculation of the Sciatic-Function-Index by using an automated gait analysis tool (CatWalk by Noldus); finally evaluation after 14 and 28 days comprises histomorphometry of long- and cross-sections of the nerve proximal, distal, and in the squeezed area; MRI analysis; and calculation of the gastrocnemius muscle weight ratio.

Anticipated Results

We expect faster nerve regeneration in the subgroups treated with ASCs. We suppose to find in these groups histological and radiological signs of accelerated nerve regeneration, as well as functional improvement and lesser muscle weight loss due to denervation and functional impairment.

11.50 ASSESSMENT OF EAR MOVEMENT IN TRANSGENIC MICE: A NEW ANIMAL MODEL TO ACCURATELY MEASURE SURGICAL OUTCOMES

Jonathan LECKENBY, Jeff W. LICHTMAN, Adriaan GROBBELAAR, Cambridge, Massachusetts, USA

Background

Animal models play an important role in understanding and development of surgical techniques. When assessing nerve regeneration few clinical animal models exist, particularly in mice. A mouse model is important to establish as several transgenic lines exist which allow axonal regeneration to be examined using fluorescent microscopy. As yet no clinical outcome measures have been established.

The aim of this study is to propose a clinical outcome measure using the ear movement of mice to assess the recovery of the posterior auricular branch of the facial nerve after surgical intervention.

Material and Methods

Male and female YFP-16 mice were used for this study consisting of four groups (all n=10): Sham group, Crush group, Nerve Repair group and Nerve Graft group. All groups were followed pre – and post-operatively on days 0, 1, 5, 10, 20 and 30 by video stereo-imaging analysis. Three tattoo markers were used to track ear movements following intervention.

Results

Ear movement was significantly reduced in all groups at post-operative day 1. The sham group had no significantly reduced movement after post-operative day 5. All other groups had significant improvements in the restoration of movement post-operatively, with the Crush group achieving the best results. The Nerve Repair group and Nerve Graft group had significant differences at post-operative days 20 and 30.

Conclusions

Tracking ear movements in mice is a sensitive tool in assessing outcomes of nerve surgery, particularly with regard to facial nerve. With this model, differences in the regeneration of the four groups can be distinguished. This allows us to investigate transgenic lines in detail and allows a clinical outcome to be applied non-invasively. Benefits of using mice in research include their size, allowing nerve regeneration to be assessed using fluorescent and electron microscopy where specimen sizes can equate to extremely large data sets.

12.00 THE PROXIMAL MEDIAL SURAL NERVE BIOPSY MODEL: A STANDARDIZED AND REPRODUCIBLE CLINICAL MODEL FOR THE EVALUATION OF BIOARTIFICIAL NERVE GUIDES

Ahmet BOZKURT, Sabien VAN NEER VEN, Kristi G. CLAEYS, Dan Mon O'DEY, Angela SUDHOFF, Gary A. BROOK, Bernd SELLHAUS, Bernd SCHULZ, Jörg B. SCHULZ, Joachim WEIS, Norbert PALLUA, Aachen, Germany

Background

The step from experimental studies to the device implementation of bioartificial nerve guides in the clinical setting is often substantial and the clinical outcome unpredictable. This is mainly linked to the clinical heterogeneity of peripheral nerve injuries which is very different from standardized animal studies. In search of such a reproducible human model for bioartificial nerve guide implantation, we propose the reconstruction of sural nerve defects after routine nerve biopsy as a standardized model.

Methods and Results

Our concept uses the proximal medial sural nerve in patients with clinically indicated diagnostic nerve biopsy ($\geq 2\text{cm}$) under local anesthesia. As part of an ongoing clinical study, a total of $n=16$ patients were treated with the novel bioartificial nerve guide Neuromaix. Inclusion criteria were patients between 18-70 years with clinical and electrophysiological diagnosis of peripheral neuropathy. Exclusion criteria were alcohol-related or paraneoplastic polyneuropathy (PNP), peripheral vascular disease, diabetes, infectious diseases (HIV, hepatitis) etc.

The operative technique included exposure of the proximal medial sural nerve between the medial and lateral head of the gastrocnemius muscle. After excision of the 2cm nerve biopsy, the nerve guide was implanted by means of entubulization using 8.0 microsurgical interrupted mattress sutures.

Multimodal sensory testing was performed pre- and postoperatively directly after surgery, at 1, 3, 6, and 12 months after surgery at the ipsilateral and contralateral (untreated) site for intraindividual comparison. This included clinical evaluation, nociception (VAS-Visual Analog Scale), loss of sensation at the lateral aspect of the foot, Tinel's sign, spatial resolution (static and moving two-point discrimination), pressure (Semmes-Weinstein monofilament test), thermoception and vibration (128Hz tuning fork).

Conclusions

Despite limitations, the presented model is a safe, effective, standardized and reproducible human model for nerve guide implantation enabling the transition of nerve guides that have passed all preclinical testings into the clinical setting ("from bench to bedside").

13.30 NATIVE IMMUNITY AND TISSUE REPAIR: THE ROLE OF INFLAMMASOME IN WOUND HEALING IN GENETICALLY DIABETIC MICE OPENS NEW PERSPECTIVES IN PLASTIC SURGERY

Michele R. COLONNA, Francesco SQUADRITO, Ferdinando STAGNO D'ALCONTRES, Domenica ALTAVILLA, Mariarosaria GALEANO, Francesco STAGNO D'ALCONTRES, Alessandra BITTO, Messina, Italy

Background

Wound healing in diabetics is impaired by an increased and persistent inflammatory response, together with a reduced angiogenesis.

Type II diabetes is also accompanied by triggering of NLRP3 inflammasome activation resulting in secretion of inflammatory cytokines IL-1 β and IL-18, both responsible for insulin resistance and organ dysfunction as well as for pain induction in a keratinocyte-neural structures cross talk.

Following previous experiments of our group, in this report we started to evaluate the effects of inflammasome NLRP3 blockade, as a novel tool to improve wound healing.

Materials and Methods

An incisional skin wound was produced on the back of female diabetic mice (db+/db+) and their normal littermates (db+/+m). Animals were given daily two inflammasome blocking agents, BAY 11-7082 (20 mg kg⁻¹ i.p.), or BBG (45.5 mg kg⁻¹ i.p.), or vehicle. Mice were sacrificed on 3, 6 and 12 days and measurements of NLRP3, caspase-1, vascular-endothelial-growth-factor (VEGF), ASC, SDF-1 expression; IL-1 β and IL-18 wound content and time to complete wound closure, as well as histology, were carried out.

Results

Increase of activity of all parameters, as well as reduction in expression of VEGF and SDF-1, were registered in non treated mice; treatment with blockade completely inverted their trend, reduced recovery time and histology showed unlock of healing as well as angiogenesis and vasculogenesis.

Conclusions

This report highlights the critical role of inflammasome in impaired wound healing, Blockade could be considered as a promising pharmacological tool in order to improve tissue repair and regeneration in plastic surgery, in fact the resulting enhanced angiogenesis together with reduced pain could be useful both in wound healing and nerve repair.

13.40 THE ROLE OF NADPH OXIDASES (NOX) IN WOUND HEALING

Dominik LÉVIGNE, Ali MODARRESSI, Karl-Heinz KRAUSE, Brigitte PITTET- CUÉ-NOD, Geneva, Switzerland

Background

NADPH oxidases (NOX) are mediating intracellular redox signaling by generating reactive oxygen species (ROS). Signaling cascades triggered by stresses, cytokines, vasoactive agents, and hormones control the expression and activity of NOX. They are involved in many cellular functions, including differentiation, proliferation, apoptosis, fibrosis, cytoskeletal regulation, migration, and contraction. The isoform NOX4 was recently shown to influence the differentiation and activity of cardiac and pulmonary myofibroblasts. Data specifically investigating the role of NOX enzymes in wound healing is very limited and their function in cutaneous myofibroblast expression is unknown. In this study, we investigate the role of NOX4 in skin wound healing and whether it is required for myofibroblast expression.

Materials and Methods

A circular, full thickness wound of 1.8cm² was created on the back of NOX4 knockout mice (n=14) and compared to those on wild type mice (n=12). Wounds were photographed daily until complete wound closure. Two mice of each group were sacrificed at day 7 and at day 14; the wound tissue was harvested for histological analysis.

Results

NOX4 knockout mice healed significantly slower (22 days, SD=1.8) than wild-type mice (17 days, SD=1.4, p=0.0002). No clear histological difference in thickness or appearance of the granulation tissue was observed. There was no difference in myofibroblast expression in the granulation tissue between NOX4 knockout mice and wild type mice.

Conclusions

Redox signaling orchestrated by NOX4 enzymes seems to play an important role in wound healing. However, NOX4 was not required for myofibroblast expression and appears to influence wound healing through other mechanisms. Further research is needed to elucidate which aspects of wound healing are most influenced by NOX4-mediated redox signaling.

13.50 SKIN WOUND HEALING IN A RABBIT EAR MODEL ENHANCED BY INTRALESIONAL INJECTION OF PLATELET RICH PLASMA

Dimitrios DIONYSSIOU, Eferpi DEMIRI, Pericles FOROGLOU, Leonidas PAVLIDES, Georgia Alexandra SPYROPOULOU, Thessaloniki, Greece

Background

The purpose of this study is to evaluate the role of the intralesional injection of platelet-rich plasma (PRP), in the acceleration of wound healing.

Material and Methods

Forty full thickness skin defects were created measuring 2X2 cm, in both ears of twenty white New Zealand rabbits (mean weight 3,5 kgr). In the study group (20 ulcers), autologous PRP was intralesionally injected and followed by conventional dressings for up to 4 weeks. The ulcers of the control group (n=20) were treated conservatively. Macroscopic evaluation of the healing process was assessed after a period of 28 days.

Results

Nineteen out of twenty ulcers were treated with PRP intralesional injection and healed uneventfully within a mean time of 24,9 days. In the control group, seven ulcers healed within a mean period of 26,7 days, seven ulcers were unhealed at the 28th day and in the last six cases, an aggravation of the ulcer was recorded, resulting a full thickness ear defect.

Conclusions

Intralesional injection is a novel method of application of platelet-rich plasma and represents an effective therapeutic option in dealing with non-healing or slow-healing wounds. In the majority of ulcers, a healing acceleration is recorded, leading to complete epithelisation.

14.00 ISOLATION OF ANGIOGENIC FACTORS FROM HUMAN PERIPHERAL BLOOD FOR THE DEVELOPMENT OF A BIOACTIVE DRESSING

Arndt F. SCHILLING, E. HADJIPANAYI, A.T. BAUER, P. MOOG, H. KÜKREK, B. SALGIN, L. BAUER, A. SCHLÜTER, M. NINKOVIC, H.G MACHENS, Munich, Germany

Background

Chronic wounds show a limited capacity for adaptive angiogenesis, although this capability is preserved in other tissues of the same patient. Our group develops strategies to isolate autologous angiogenic proteins (AAPs) from healthy cells to transplant them to the non-healing tissue (Project EmaCure).

The aim of the current work was to test if peripheral blood cells can be used as source for AAPs and what kind of carriers qualify for efficient delivery of these proteins.

Materials and Methods

For this, we cultivated blood of healthy human donors under normoxia and hypoxia (3% O₂). The produced AAPs were collected in cell-free gel-carriers (collagen gel, hydrosorb gel, polyhexanid gel). AAPs which diffused out of the gels (VEGF, Angiogenin, Thrombospondin-1) were quantified by ELISA and their effectiveness was analyzed in in-vitro angiogenesis assays (tube formation assay, directional migration assay, microvessel sprouting assay).

Results

We could show that hypoxia influences the expression of the angiogenic proteins VEGF, Angiogenin, Thrombospondin-1 relative to the normoxic baseline. The AAPs could be collected in cell-free carriers. Release of VEGF from those carriers was significantly higher from collagen, than from hydrosorb or polyhexanid gels.

Conclusions

We show here a method which allows to produce a personalized bioactive dressing from autologous blood which activates angiogenesis.

We hope that this will help to improve the treatment of chronic wounds.

14.10 CLINICAL APPLICATION OF MESENCHYMAL STEM CELLS ISOLATED FROM LIPOASPIRATE FOR THE TREATMENT OF CHRONIC SKIN ULCERS

Nicolò BERTOZZI, Eugenio GRIGNAFFINI, Michele GRIECO, Elena BOSCHI, Giorgia CARUANA, Edoardo RAPOSIO, Parma, Italy

Background

The treatment of skin ulcers requires a world annual financial commitment of 7 billion euro, affecting approx. 1% of adults and 3.6% of people aged over 65 years and are responsible for 85% of all non-traumatic lower limb amputations.

In this study, the authors present their experience with the use of mesenchymal stem cells derived from adipose tissue (ADSC) combined with autologous PRP in the treatment of chronic skin ulcers.

Materials and methods

Each patient being considered for intervention with stem cells is subjected to a blood sample, fractionated by centrifugation, in order to obtain an autologous platelet rich plasma (PRP) , and to a conventional liposuction (local anesthesia, aspirated volume about 80cc) , in order to isolate a pellet of ADSC, which is then mixed with the PRP previously produced, in order to obtain an enhanced-ADSC-PRP (e-PRP) , now ready for grafting. This autologous e-PRP is injected in the context of skin edges as well as in the bottom of the lesion itself. The main stages of our process include: under a laminar flow hood, place the 10 ml syringes in a cellular shaker (6000 vbr / min x 6 min), then centrifuge the syringes at 600 rpm x 6 min . They will split in 4 levels : oil, fatty tissue, liquid phase and cellular pellet, which is added to the PRP, ready to be inoculated.

Results

Stem cells obtained from lipoaspirate significantly increase the healing process and tissue regeneration, patients experience significantly less pain and any subsequent skin grafts positioned to the same area show better engraftment.

Conclusions

The use of ADSC has proven a valuable resource for the treatment of chronic skin ulcers, both individually and combined with other therapeutic options such as skin grafts.

14.20 THE ROLE OF ADSC'S IN IMPROVING THE RESOLUTION OF COMPLICATED ULCERS

Monica RUCCI, Luigi ANNACONTINI, Domenico PARISI, Michela CAMPANARO, Aurelio PORTINCASA, Foggia, Italy

Background

Lipofilling is a surgical procedure used both for cosmetic and reconstructive purposes. The technique relies on recognition in fat tissue, of Multipotent stem cells, which can be used to improve the texture, softness and elasticity of pathological tissues (scars, ulcers, skin irregularities). The authors present their experience in treating vascular ulcers of the lower limbs with lipofilling.

Material and Methods

Between June 2011 and February 2013 were treated 9 patients: 4 venous ulcers, 3 vascular ulcers, 1 ulcer complicated by osteomyelitis and 1 post-traumatic. All patients were subjected to at least 2 cycles of lipofilling, 4 months from each other, using adipose tissue taken from the abdominal region. After 15 days a single expert surgeon assessed: cutaneous trophism and elasticity of the skin, presence of granulation tissue, pain reduction (VAS scale), wound reduction.

Results

All patients had pain reduction (from 9 to 5 according to VAS scale). The lesions all improved in: surrounding skin trophism, appearance of granulation tissue in the wound margins, size reduction. 3 patients were brought to complete healing with advance dressing in 4 weeks after the second treatment, 5 patients are still being treated.

Conclusions

The fat transfer is an easy run technique, limited invasiveness, executable in Day-Hospital, repeatable and with high compliance, revealing an additional weapon in treating complicated ulcers.

14.30 LASER DOPPLER FLOWMETRY FOR THE ASSESSMENT OF ADSCS TREATMENT EFFECTIVENESS IN CHRONIC CUTANEOUS ULCERS

Nicolò BERTOZZI, Michele GRIECO, Eugenio GRIGNAFFINI, Elena BOSCHI, Giorgia CARUANA, Edoardo RAPOSIO, Parma, Italy

Background

Over the years multiple medical and surgical approaches have been proposed for the treatment of chronic cutaneous ulcers, leading to a two-years estimated health care expense that vary from €5000 to €28000 each wound. The aim of this study is to assess the effectiveness of ADSCs treatment of chronic cutaneous ulcers by means of Laser Doppler Flowmetry (LDF) and Oxygen Transcutaneous Pressure (TcPO₂).

Material and Methods

We report a 9 months experience of evaluation of capillary permeability and skin perfusion by means of LDF and TcPO₂ assessment. Fifteen patients (mean age 65 years old), 10 males and 5 females, with chronic cutaneous ulcer, were enrolled in the study. Each of 15 patients underwent to ADSCs graft and every wound has been evaluated before, during, and after surgery through LDF and TcPO₂.

Results

Although we assessed a limited number of patients, so far our data showed an increased perfusion and TcPO₂ values following ADSCs treatment.

Conclusions

LDF is a non-invasive method allowing a detailed microcirculation study which, together with TcPO₂, allows to analyze the effectiveness of treatment which aim is to improve wound healing by microcirculation enhancement.

14.40 SHORT-TERM DELIVERY OF FIBRIN-BOUND VEGF PROTEIN IN OSTEOGENIC GRAFTS: INCREASED VASCULARIZATION WITH EFFICIENT BONE FORMATION

Maximilian BURGER, Nunzia DI MAGGIO, René D.LARGO, Michael HEBERER, Ivan MARTIN, Arnaud SCHERBERICH, Dirk J. SCHAEFER, Andrea BANFI, Basel, Switzerland

Background

Reconstruction of bone defects is a major challenge in tissue engineering. Bone marrow mesenchymal stem cells (BMSC) are valuable multipotent progenitors for regenerative medicine. Spontaneous vascularization of BMSC-loaded osteogenic grafts in vivo is too slow to allow survival of the progenitors in constructs larger than a few millimeters. Vascular endothelial growth factor (VEGF) is the master regulator of angiogenesis. We previously found, that sustained over-expression of VEGF by genetically modified human BMSC was effective to improve vascularization of tissue engineered bone grafts, but also caused an undesired increase in osteoclast recruitment with excessive bone resorption. Here we hypothesized that short-term delivery of VEGF protein bound to fibrin gels may improve graft vascularization without impairing bone formation.

Material and Methods

Primary human BMSC were retrovirally transduced to express VEGF linked to CD8, as a surface marker, or just CD8. Recombinant VEGF was engineered with a transglutaminase substrate sequence (TG-VEGF) to allow covalent cross-linking into fibrin hydrogels. BMSC were seeded on apatite granules in fibrin pellets. Bone formation and vascularization were determined histologically 1, 4 and 8 weeks after ectopic subcutaneous implantation in nude mice.

Results

One week after implantation, both the constructs with naive BMSC and fibrin-bound TG-VEGF and those with VEGF-expressing BMSC displayed increased vascularization compared to the controls with naive BMSC only. After 4 weeks fibrin gels were completely degraded in all conditions. After 8 weeks both fibrin-bound TG-VEGF and VEGF-expressing BMSC induced significantly increased vascularization compared to naive BMSC only. However, while bone formation was severely impaired with VEGF-expressing BMSC as expected, fibrin-bound recombinant TG-VEGF allowed the formation of bone tissue as efficiently as by naive BMSC alone.

Conclusions

These data suggest that short-term delivery of recombinant VEGF protein, providing an attractive and clinically applicable strategy to ensure both rapid vascularization and efficient bone formation.

14.50 BONE REGENERATIVE CAPACITY OF RHBMP-2 LOADED CARBOXYMETHYLCHITOSAN MICROSPHERES IN A RAT CALVARIAL DEFECT

Petros KONOFAOS, Dana PETERSEN, Joel BUMGARDNER, Robert WALLACE, Memphis, Tennessee, USA

Background

The purpose of this study was to determine the bone regenerative capacity of recombinant human bone morphogenic protein 2 (rhBMP-2) loaded carboxymethylchitosan (X-CMCS) microspheres using a critical-sized rat calvarial defect model compared to treatment with demineralized bone matrix (DBM).

Material and Methods

In ten male Wistar rats a critical-sized (10 mm) calvarial defect was created and animals randomly divided into two groups of five animals each. In the control group (group 1) the defect was loaded with DBM. In the experimental group (group 2), X-CMCS microspheres were placed in the defect. At 4 weeks, after animal's euthanization, calvarial specimens were examined by microCT, histology and histomorphometry.

Results

New areas of bone growth were seen in the defects of all treated animals. There were no statistical differences in microCT data for mineral density, percent bone fill or bone surface to volume ratios between groups, though the bone surface to volume ratio for the X-CMCS group ($30.0 \pm 5.2\%$) suggested increased osteoid activity as compared to the DBM group ($18.9 \pm 3.9\%$). Histological data also indicated active osteoid activity and induced bone formation in the center of defects in X-CMCS group; whereas, new bone appeared to be forming only near the defect margins of the DBM group. However, there was no significant difference at the mean percent of newly mineralized bone in the DBM group defect as compared to the X-CMCS group.

Conclusions

The ability of X-CMCS microspheres to promote bone regeneration in a critical-sized rat calvarial defect model was demonstrated. The X-CMCS microspheres displayed increased bone filling compared to the DBM implants. It was very promising that after only one month, the newly deposited bone has a mineral density approaching that of native calvarial tissue. Clinically this combination could be easily produced and delivered for the treatment of bony deficits.

15.00 ENGINEERING OF AXIALLY VASCULARIZED BONE GRAFTS FOR THE TREATMENT OF AVASCULAR BONE NECROSIS

Rik OSINGA, Laurent André TCHANG, Atanas TODOROV, Ivan MARTIN, Arnaud SCHERBERICH, Dirk Johannes SCHAEFER, Basel, Switzerland

Background:

The goal of this study is to generate a tissue engineered vascularized bone graft, potentially replacing the autologous vascularized bone graft in the treatment of avascular bone necrosis.

Material and Methods

Along the centerline, a 1,25mm hole was drilled into a cylindrical HA-scaffold of 1x1cm, which was then seeded in a perfusion bioreactor system with human SVF cells. After 5 days, the seeded scaffold was placed into a 2mm thick Tutobone® layer, which mimics avascular bone. A permeable membrane was wrapped around the entire construct to prevent cell ingrowth from outside. It was subcutaneously implanted in the left groin region of a rat by simultaneously inserting a ligated arteriovenous (AV) bundle of the deep inferior epigastric vessel through the drill hole. After 4 and 8 weeks the constructs were explanted. Immediately before sacrifice, an Indian ink / gelatin mixture was injected into the abdominal aorta to assess vascularization of the construct. The grafts were analyzed histologically, assessing bone formation and vascularization. The origin of the tissue and vessel forming cells was analyzed by in situ hybridization (ALU) and immunohistochemistry (hCD34) using human markers.

Results

Only 1 out of 12 constructs showed signs of thrombosis. Four out of 30 rats died of complications. After 4 weeks, a vascular system had developed throughout the entire scaffold both in the seeded and unseeded constructs. The pores of the unseeded constructs only contained a sparse layer of cells, producing little matrix. In the seeded constructs on the other hand, a dense layer of cells produced 'osteoid like' matrix at four weeks. The analysis of cell origin and the assessments at 8 week are ongoing.

Conclusions

The AV bundle is functional and provides vascularity throughout the entire scaffold. The cells producing 'osteoid like' matrix are dependent on the seeding process with SVF.

15.10 REGENERATIVE BONE REPAIR – TRANSLATING A PLATFORM TECHNOLOGY TO THE OPERATION ROOM

Thilo SCHENCK, Martijin VAN GRIENSVEN, Rüdiger VON EISENHARDT- ROTHE, Dietmar HUTMACHER, Hans-Günther MACHENS, Jan-Thorsten SCHANTZ, Munich, Germany

Background

Bone defects are a challenging clinical situation and bear the risk of permanent functional impairment. The drawbacks of previous approaches led to new strategies of regenerative bone repair. This contribution presents a platform technology for regenerative bone repair, which addresses a broad variety of bone defects. It consists of polycaprolactone-based scaffolds which are designed with different mechanic properties and with variations of bioactivation to suit the individual clinical situation.

Material and Methods

Polycaprolactone Tricalcium Phosphate (PCL-TCP) scaffolds were implanted in a variety of osseous defects (n = 12) including the orbita (4), metacarpal bones (3), the skull (4) and the tibia (1). Depending on the defect characteristics, scaffolds were implanted either alone, bioactivated by growth factors or bone marrow, covered by periosteal flaps or mechanically enforced by titanium struts.

Results

All patients had a full functional reconstitution and a pleasing aesthetic result (n = 12). In none of the cases intra- or postoperative complications occurred. All wounds were free of irritation or infections and no dislocations of the implants occurred. No clinically detectable foreign body reactions to the material were observed. In the radiologic follow up at 12 months, the material presented well integrated with beginning bony consolidation and without palpable defect or contours.

Conclusions

PCL-TCP implants can be considered a safe treatment option for bony defects in a variety of clinical fields. The presented platform technology can be adapted to a wide range of bone defects by its qualification for mechanical and biological enhancement.

15.40 OPEN TIBIA FRACTURES ARE BEST TREATED IN A PLASTIC-ORTHO-PAEDIC SURGICAL MULTIDISCIPLINARY SETTING.

Filippo BORIANI, Umraz KHAN, Ata Ul HAQ, Roberto URSO, Bologna, Italy

Background

Open fractures of the leg represent a severe trauma. It is often stated that combining the skills of Plastic and Orthopaedic surgeons can optimise the results of limb salvage in complex limb injury. The multidisciplinary approach, shared between plastic and orthopaedic surgeons, is likely to provide the optimal treatment of these injuries, although this multidisciplinary simultaneous treatment is not routinely performed. Given the relatively low incidence of these traumas, a multicentric recruitment of these patients can contribute in providing an adequately numerous cohort to be evaluated through the long process of soft tissue and bone healing following an open tibia fracture. We compared three centres with different protocols for management of these challenging cases.

Material and Methods

The following trauma centres, either orthoplastic or orthopaedic, were involved in a prospective observational study: Rizzoli Orthopaedic Institute/University of Bologna (leading centre) and Maggiore Hospital (Bologna), Frenchay Hospital (Bristol, United Kingdom), Jinnah Hospital (Lahore, Pakistan), a centre in the developing world where an Ortho-Plastic approach was adopted. From 01/01/2012, all patients consecutively hospitalized in the mentioned centres due to Gustilo grade 3 tibial open fractures were included in the study and prospectively followed. Demographics, mechanism of the trauma, type of lesion, timing and way of transfer to the trauma centre, as well as timing and techniques of bone and soft tissue treatment were recorded. The considered outcome measures were duration of hospitalization (main outcome measure), rate of reintervention, Enneking's functional limb score at 3, 6 and 12 months, the incidence of osteomyelitis, non union, amputation and other complications.

Results

The number of patients included in the first 6 months was 42. Mechanism, severity of injury and techniques regarding definitive bone reconstruction were similar across the three centres. The main difference occurred in soft-tissue management with VAC therapy being utilised mainly by the Italian centre compared to vascularised tissue transfer in Pakistan and Britain. The mean duration of hospital stay in the Italian centre was 72 days compared with 24 days in Pakistan and 25 days in Britain. Patients treated in a centre with an orthoplastic team, therefore, spent an average of 46 fewer days in hospital.

Conclusions

The management of open tibia fractures appears to be improved by a combined orthoplastic approach.

15.50 PILOT STUDY - INFLUENCE OF SEVERE THERMAL INJURY TO BONE METABOLISM 12-36 MONTHS AFTER TRAUMA IN ADULT PATIENTS

Elisabeth MAURER, Gabriela Katharina MUSCHITZ, Christian MUSCHITZ, Gerald IHRA, Heinrich RESCH, Thomas RATH, Vienna, Austria

Background

A severe thermal injury induces a catabolic situation, an increase of proinflammatory cytokines and endogenous glucocorticoids, as well as changes in calcium and vitamin-D metabolism. Experimental and clinical studies have shown that already during the early phase of burn injury, caused by the trauma itself but also by immobilization, a loss of bone matrix takes place. In severely burned pediatric patients impaired body growth and reduced bone density result as long-term effects of this trauma. However, a comprehensive study of late effects in severely burned adult patients in terms of bone-specific remodeling processes is still lacking.

Methodology

Serum levels of bone metabolic parameters (calcium, phosphate, 25-hydroxy-vitamin D, 1,25 dihydroxy-vitamin D, intact parathyroid hormone, alkaline phosphatase, bone-specific alkaline phosphatase, lipoprotein a, C-telopeptide, osteocalcin, ostease and aminoterminal propeptide of type I procollagen - P1NP) are investigated in adult patients with deep II-III ° burns of more than 30% TBSA 12-36 months after thermal trauma.

Objective

The aim of this study is to evaluate the influence of a severe thermal injury to bone metabolism 12-36 months after trauma compared to healthy individuals.

16.00 “BONE-ANCHORED PENILE EPITHESES”: PRE-OPERATIVE PLANNING AND IMMEDIATE OUTCOME OF THE FIRST FIVE CASES

Gennaro SELVAGGI, Rickard BRÅNEMARK, Anna ELANDER, Mattias LIDEN, Joacim STALFORS, Gothenburg, Sweden

Background

The principle of osseointegration is accepted and used in various reconstructive surgery areas: intra-oral, craniofacial, upper and lower extremities reconstructions have been performed using different types of epithesis, which are bone-anchored with titanium screws. A possible ultimate application can be represented by a “bone-anchored” penile epithesis. We present the first series of patients where titanium implants have been implanted onto the pubic bones of five transsexual patients, in order to attach a “bone-anchored” penile epithesis.

Material and Methods

Following pre-operative pubic bone examination with CT scan and computer pre-operative planning, a two-stage surgery has been performed on 5 female-to-male (FTM) transsexuals.

During the stage-1 surgery, two titanium implants (“fixtures”) have been implanted onto the pubic bone of each patient, lateral to the pubic symphysis.

During the stage-2 surgery, the skin of the mons pubis has been reduced and “abutments” have been inserted into the fixtures, and passed through the skin.

After few weeks, a penile epithesis has been attached to the bone-anchored titanium implants.

Results

Osseointegration has been confirmed by CT-scan in all 5 patients.

Stage-1 and stage-2 surgeries occurred uneventfully in all 5 operated patients.

Minor complications were: one wound infection and dehiscence, which was treated conservatively; one patient required further fat reduction around the fixtures, which was performed under local anesthesia in the outpatient clinic.

Conclusions

This preliminary clinical study demonstrates that titanium osseointegration on to the pubic bone is feasible. Preoperative planning is crucial for the selection of the appropriate implants size and the anatomical location where to set the implants.

A larger series of patients is required. A long-term follow-up on the outcome of the surgery and the patient quality of life will be provided in the near future.

16.10 THE ANATOMICAL BASIS OF THE LUMBAR ARTERY PERFORATOR FLAP: A CADAVER AND COMPUTER TOMOGRAPHY ANGIOGRAM STUDY

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Background

Lumbar skin flaps based on cutaneous perforators arising from the lumbar artery has been described for coverage of lumbosacral defects and as free flaps for autologous breast reconstruction. Currently, the available anatomical literature inadequately documents the vascular anatomy of the lumbar area therefore; the purpose of this study is to clarify aspects of the anatomy of the lumbar artery perforator flap in order to improve the utility and the design of this flap.

Material and Methods

Five fresh human bodies were dissected and twenty three-dimensional computed tomographic (CT) angiographic previously used for the evaluation of the deep inferior epigastric perforator flap in patients that underwent breast reconstruction were evaluated. All cutaneous lumbar artery perforators were analyzed for total number, location, and external diameter. Based on anatomical finding we propose several design patterns for the lumbar artery perforator flap as long as a review of its indication having a clinical case as an example.

Results

The number of perforators observed side were of 1,6 x 0,84 in the CT angiography and 3 x 1,05 in the cadaver study. This perforators were located at a the mean distance from the midline (spinal process) of 76,56 x 6,97 mm. The clinical cases presented are of two patients with a lumbosacral defects reconstructed with pedicled perforator flaps based on a lumbar artery perforator vessels.

Conclusions

The lumbar artery perforator flap is based on a perforator that has a predictable location and presents a good caliber. Versatility of design of a pedicled flap as a propeller, bilobed or transposition flap based on this reliable perforator can be useful to reconstruct complex defects in the lumbar area. Preoperative planning with CT angiography is recommended to assess the location and calibers of the perforator to allow a better design of the flap.

16.20 AN ANATOMICAL INVESTIGATION WITHOUT CADAVERS: HOW TO RECYCLE CT SCANS TO STUDY PERFORATOR ANATOMY IN THE ABDOMEN

Sebastiano OIENI, Claudia LIUZZA, Corrado REINA, Salvatore D'ARPA, Francesco MOSCHELLA, Palermo, Italy

Background

Cadaver investigations of vascular anatomy, with dissection and radiographs or CT scans are time-consuming and study a static circulation.

The aim of this study was to evaluate the feasibility of an anatomical study on CT scans in living individuals and re-used for research.

Material and Methods

200 abdominal CT scans were selected from the radiology archive.

Axial, coronal and sagittal views were analyzed to detect perforators of more than 1mm. Distances from the midline and from the xyphoid were recorded and transferred to an X-Y grid, that can be reproduced on a patient's skin to mark the perforator's position.

In the axial plane, each image has been divided in four quadrants by two orthogonal lines that intersect on the anterior border of the vertebrae. The quadrants are: Q1 (anterior right), Q2 (anterior left), Q3 (posterior left) and Q4 (posterior right).

Direction and course of each perforator were recorded.

Statistical analysis was performed with the Kramer's index that measures the constancy of perforator position.

Results

5,127 total perforators were identified.

The average number of perforators was 25.64/patient, distributed as follows: Q1 6,08; Q2 7,2; Q3 6,19; Q4 6,14.

Most perforators have an oblique course 3,793 (73%), 928 (18%) vertical and 460 (9%) horizontal.

The Kramer's index showed a positive correlation between the X and Y values showing consistent

Conclusions

This study demonstrates that CT scans obtained for the study of abdominal disease and stored in a conventional radiological archive provide an enormous database for anatomical investigation. There is no need for cadaver preparation and dissection and a dynamic circulation is studied without consuming extra resources at the only expenses of the time needed to study the CT images. This result introduces the possibility of performing anatomical studies without cadavers that can be used for other purposes.

16.30 NEW INSIGHTS INTO THE ARTERIAL SUPPLY OF THE UMBILICAL STALK AND SKIN

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Background

Wound healing problems and necrosis of the umbilicus are known complications after performing abdominal wall surgery, such as abdominoplasty or hernia repair. The aim of this study is to provide a detailed description of the arterial architecture of the umbilicus that would enable intraoperative preservation of the umbilical vasculature.

Material and Methods

The arterial architecture of the umbilicus was examined in 19 fresh Caucasian cadavers (9 males, 10 females; mean age 78.7 years).

In 12 cadavers an anatomical micro-dissection study using methylene blue injections was performed. In 7 cadavers the deep inferior epigastric and the internal thoracic arteries were injected with epoxy-resin mixes. The anterior abdominal wall was then harvested and plastination was performed.

Results

In all specimens one dominant artery supplying the umbilicus was found. It arises from the medial branch of the deep inferior epigastric artery and perforates the posterior rectus sheath. It courses through a retroumbilical, preperitoneal loose adipose tissue to take part in forming an arterial plexus deep to the umbilicus. Due to its relevance in supplying the umbilicus we named this dominant umbilical artery ramus anastomoticus retroumbilicalis. In addition to the rami anastomotici retroumbilicales, the retroumbilical vascular plexus receives arterial inflow from intraligamentous arteries of the falciform ligament, the round ligament of the liver, the median and both medial umbilical ligaments. Between these confluent arterial sources extensive vascular communications were found. From the retroumbilical vascular plexus arteries enter the papilla umbilicalis in the area of the umbilical ring, course radially through the periumbilical connective tissue of the umbilical stalk and unite with the subdermal vascular plexus.

Conclusions

This study provides new anatomical information on the arterial vasculature of the umbilicus that may help to preserve umbilical blood supply during surgery of the abdominal wall and possibly reduce the risk of wound healing problems and umbilical necrosis.

16.40 1-CM VERSUS 2-CM EXCISION MARGINS FOR PATIENTS WITH INTERMEDIATE THICKNESS MELANOMA

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Background

In the management of patients with intermediate thickness melanoma, the optimum excision margins are still unclear. The aim of this study was to compare the outcome of 1-cm margin with 2-cm margin in patients with tumour thickness of 1.1-4.0 mm.

Material and Methods

This is a retrospective study based on matched-pairs design. Equal patient cohorts were constructed in terms of gender, age, Breslow thickness and the anatomic location of the primary lesion. There were 80 patients who underwent an excision with 1-cm margin and 80 patients with 2-cm margin. Follow-up data were analysed by Kaplan-Meier method and Cox regression model.

Results

After a median follow-up time of 41 months, there were no differences in relapse-free survival or melanoma-specific survival between study groups. The wound was closed directly in 62 patients (78 %) in the 1-cm group and in 36 patients (45 %) in the 2-cm group

Conclusions

The results of this study suggests that 1-cm margin is sufficient in melanomas of 1.1-2.0 in Breslow thickness. In thicker tumours (2.1-4.0 mm), this recommendation cannot be given due to the low number of patients and follow-up events.

16.50 CUTANEOUS HIGH-FREQUENCY SONOGRAPHY IN THE EVALUATION OF MELANOMA THICKNESS AS A GUIDE FOR SENTINEL LYMPH NODE BIOPSY

Sergio MARLINO, Fabrizio SCHONAUER, Luigi CANTA, Massimiliano SCALVENZI, Mario DELFINO, Maria SCOTTO DI SANTOLO, Guido MOLEA, Naples, Italy

Background

Excisional margins of cutaneous melanoma and indication for sentinel lymph node biopsy depend on tumor thickness. Recent advances in ultrasound imaging allow accurate characterization and measurement of cutaneous lesions. This prospective study aims to rate clinical value of 17-MHz sonography as a discriminator in measuring melanoma thickness before excision.

Material and Methods

Study population included 34 patients (17M:17F) with clinical and stereomicroscopic diagnosis of cutaneous melanoma. Each melanoma was examined with epiluminescence microscopy and then evaluated by sonography using linear 17-MHz frequency ultrasound sensor. Sonographic thickness was measured scanning from skin surface to the deepest point of lesion. Two groups of melanoma were identified according to thickness: $\leq 1\text{mm}$ and $>1\text{mm}$. Patients received standard surgical treatment relative to each category. After surgical resection, lesions were histologically analyzed to confirm melanoma diagnosis and to determine Breslow thickness. Comparative data analysis of histological and sonographic measurement was performed using Bland-Altman method. Linear relationship between two methods was estimated and interclass concordance correlation coefficients were calculated. Sensitivity, specificity, positive and negative predict values (VPP, VPN) of sonography in identifying lesions $>1\text{mm}$ thick were calculated.

Results

On sonography, 7 lesions measured $\leq 1\text{mm}$ and 27 lesions $>1\text{mm}$. Of these, histopathologic analysis showed 6/7 lesions with Breslow index $\leq 1\text{mm}$ and 26/27 lesions with a Breslow index $>1\text{mm}$. Sonographic measurement demonstrated a rather accurate correlation with a Breslow thickness. Stronger interclass correlation ($r=0,9183$)

Conclusions

Sonography was effective in discriminating between melanomas $\leq 1\text{mm}$ and $>1\text{mm}$ thick. The use of 17-MHz sonography in preoperative assessment of cutaneous melanomas allows the performance of single-stage surgery, reducing the waiting time before definitive surgical excision and may, therefore, prove to be a cost-saving procedure.

17.00 MICROSURGERY SIMULATION TRAINING – A NEW SYSTEM TO COMPLEMENT EVERY TRAINING PROGRAMME

Dhalia MASUD, Nadine HACHACH-HARAM, Pari-Naz MOHANNA, London, United Kingdom

Background

Microsurgical techniques are essential in Plastic Surgery but with changes in training, acquiring these skills can be difficult. To address this, we have designed a standardised laboratory-based microsurgical training programme, which allows trainees to develop their dexterity, visuospatial ability, operative flow and judgement as separate components.

Material and Methods

Thirty trainees completed an initial microsurgical anastomosis on a chicken femoral artery assessed using the Structured Assessment of Microsurgical Skills (SAMS) method. The study group (n=15) then completed a three-month training programme whilst the control group (n=15) did not. A final anastomosis was completed by all trainees (n=30).

Results

The study group showed a significant improvement in their SAMS scores (mean score 4 versus 7, Wilcoxon rank test p0.05). There was also a significant difference in the final SAMS score between the control and study group (mean score 10 versus 4, Mann Whitney U test p<0.05).

Conclusions

This validated programme is a safe, cost-effective and flexible method of allowing trainees to develop microsurgical skills in a non-pressured environment. In addition the objectified skills allow trainers to assess the trainees' level of proficiency before operating on patients.

17.10 'ALL TIED UP' – A TOOL FOR DEVELOPING MICROSURGICAL SKILLS

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Background

Microsurgery requires operating within a narrow field allowing complete visualization and economy of movement. Novice microsurgeons used to operating macroscopically have a tendency to hold their hands further apart, leading to inefficient movements. We present a validated method that allows novices to develop this aspect of microsurgery.

Material and Methods

The hands are stabilized in a narrow field by immobilizing the little fingers with elastic bands secured to a board. The surgeon is asked to tie an instrument knot around a hook attached to the board under the microscope. This is repeated three times. Each knot is timed and assessed for quality. Fifteen novices and 4 senior microsurgeons were asked to complete the above task and their results were compared.

Results

For novices, the mean time to complete a knot in the third attempt was significantly faster than the first (90.47 seconds versus 153 seconds, Friedman's test, $p=0.0001$). There was no significant difference in the number of satisfactory knots with each attempt. The senior surgeons were significantly faster and all had satisfactory sutures (35 seconds versus 90.47 seconds Friedman's test).

Conclusions

'All tied up' is a safe, cost effective and validated method of learning to operate efficiently within a narrow microsurgical field.

17.20 THE 'IN-OUT-UP-DOWN' TRAINING MODEL FOR THE DEVELOPMENT OF DEXTERITY AND VISUOSPATIAL SKILLS IN MICROSURGERY: A VALIDATION STUDY

Whitney CHOW, Nadine HACHACH-HARAM, Dhalia MASUD, Saour SAMER, Pari-Naz MOHANNA, London, United Kingdom

Background

Successful microsurgery relies on visuospatial ability, dexterity and instrument handling. Simulation training is becoming key in both bridging the training gap resulting from reduced hours and pressures on theatre efficiency. We have designed and validated a laboratory based training model which allows trainees to develop these skills.

Material and Methods

Mepitel was mounted in a cardboard frame folded to create a self-standing zigzag pattern for depth variation. An 8/0 nylon suture was passed forehand and backhand through consecutive Mepitel perforations. The task was timed and assessed for quality. Fifteen trainees repeated the task over a 3 week period. Four senior surgeons completed the task for validation purposes and completed a questionnaire regarding the usefulness of the task.

Results

Novice surgeons showed a significant improvement in their times between the first and third week (451.9 secs vs 300.2 secs,).

Conclusions

The 'In-out-up-down' task is a low cost, safe, validated bench model which aids in the development of 3-D visuospatial skills, dexterity and instrument handling.

17.30 EFFECT OF COMPUTER GAMES AND MUSICAL INSTRUMENTS ON MICROSURGERY

Margarita MOUSTAKI, Dhalia MASUD, Nadine HACHACH-HARAM, Pari-Naz MOHANNA, London, United Kingdom

Background

Microsurgical techniques require manual dexterity and co-ordination. Outside medicine, such skills are also required in playing musical instruments and computer games. We conducted a study to evaluate whether having such skills can be correlated to microsurgical skills.

Material and Methods

Eighty novice trainees were asked to complete a questionnaire on their level of experience with musical instruments and computer games. They were then asked to complete a microsurgical anastomosis on a chicken femoral artery. This was assessed using the Structured Assessment of Microsurgical Skills (SAMS) method.

Results

Twenty trainees played computer games 'regularly' or 'often' and 60 trainees 'rarely' or 'never'. There was no significant difference between the SAMS scores of the two groups (mean SAMS 4 verses 5 respectively, t-test $p > 0.05$).

Thirty novice trainees played one or more musical instruments 'regularly' (including guitar, piano saxophone and flute) to grade IV or above whilst 50 never played any musical instrument. There was a significant difference between the SAMS score of the two groups (mean SAMS 6 verses 4 respectively, t-test $p > 0.05$).

Conclusions

There is a correlation between the skills required to play a musical instrument and microsurgical SAMS score but not computer games. Could these results be useful in the selection of microsurgeons of the future?

8.30 SHOULD FREE NIPPLE-GRAFT TECHNIQUE BE HISTORY IN BREAST REDUCTION SURGERY?

Zeynep KARACOR ALTUNTAS, Haldun O. KAMBUROGLU, Nurten YAVUZ, Mehmet DADACI, BilseV INCE, Konya, Turkey

Background

In breast reduction surgery, to preserve the vascularisation of breast and nipple areolar complex is very important. However, free nipple grafting technique has been performed in patients with massive hypertrophy. We evaluated the patients of gigantomastia operated with the central pedicle horizontal scar reduction mammoplasty technique.

Material and Methods

The new nipple is positioned at the inframammary fold or 1-2 cm below. The level of the new inframammary line (IML) is marked 6 cm below the new areola. All the area between the marked IML and the present sulcus is de-epithelialized. The upper flap is undermined beginning from the new IML. The tissue excision is performed medially and laterally leaving a central pedicle that also carries the nipple-areola complex (NAC). The NAC is passed under the upper apron flap through its new opening.

Results

We retrospectively reviewed 217 patients who were operated with this technique. 32 patients (64 breasts) whose midclavicle to nipple distance were at 38 cm or more were included to this study. The distance preoperatively from midclavicle to nipple ranged between 38-45 cm. The weight of breast tissue excised ranged between 1450 to 2785 gr.

Conclusions

We were safely able to reduce all breasts without need of free nipple grafting technique. The central pedicle horizontal scar breast reduction technique is a very safe and effective technique where large mass excision required as free nipple reduction should never be considered for breast reduction, no matter how big the breast is.

8.40 WHERE SHOULD WE PLACE THE NIPPLE AREOLAR COMPLEX IN SUPEROMEDIAL PEDICLE-INVERTED T SCAR REDUCTION MAMMOPLASTY TECHNIQUE?

Zeynep KARACOR ALTUNTAS, Haldun O. KAMBUROGLU, Nurten YAVUZ, Mehmet DADACI, Bilsev INCE, Konya, Turkey

Background

Stable nipple areolar complex (NAC) position in reduction mammoplasty patients is a challenging problem free of the technique that is preferred. In this study, we aimed to find out proper nipple areolar position after inverted T scar-superomedial pedicled reduction mammoplasty. To our best of knowledge this is the first report about nipple position and lower pole length based on numerical data in this technique.

Material and Methods

Forty-eight female patients (96 breast) were included in this study. The inclusion criteria were there should be no previous operation to any of the breasts and both NAC complex should be at 30th cm from the midclavicular point. Preoperatively the distance from midclavicular point to new nipple were recorded. All patients were operated with inverted T pattern and superomedial pedicle. Vertical arm of the T scar pattern was set to 5.5 cm. Resection weights, midclavicular point to nipple distance and the NAC lower border to inframammary fold distance were evaluated postoperatively with average 15 month follow up.

Results

The mean distance from midclavicular point to nipple was found 34.21 for the right breast and 34.26 cm for left breast, postoperatively. The mean resection weight per breast was found 1035 gr for the right breast , 1081 gr for the left breast. Nipple position was set to mean 21.12 cm from the midclavicular point. Postoperatively, the mean nipple position was measured at 22.73 cm for right breast, 22.91 cm for left breast. The mean distance from the lower edge of NAC to inframammary fold was 8.81 cm for right breast 9.09 cm for left breast. According to this findings, descent of the NAC was found 1.61 cm for right breast, 1.79 cm for left breast (mean: 1.7 cm). Additionally, inframammary length have increased 3.31 cm for right breast , 3.59 cm for left breast (mean: 3.45 cm).

Conclusions

In this study, we found that the new nipple position descends in long term follow up. On the other hand, it was not located at the most projected area of the breast and it was seen as high nipple. This was because, the lower pole of the breast sag more than the nipple and clinically we saw nipple with 1.75 cm (3.45 minus 1.7 =1.75) superior displacement. According to the results of this study, if more than 1000 gr breast tissue is planned to be resected, the new nipple should be placed 1.5-1.75 cm below the planned position.

8.50 CORRELATION BETWEEN NIPPLE ELEVATION AND BREAST RESECTION WEIGHT: HOW TO PREOPERATIVELY PLAN BREAST REDUCTION

Mariagrazia MOIO, Fabrizio SCHONAUER, Naples, Italy

Background

Breast hypertrophy is often associated with functional limitation in performing daily activities, as back pain or psychological repercussions. Beyond the aesthetic concerns, breast reduction can allow an improvement in symptoms and self-esteem. However, it is difficult to identify objective criteria to establish the boundaries between aesthetic and functional purposes. In different countries, Institutions responsible for regulation of Health care system have fixed 500 grams of predicted tissue resection for each breast as threshold for reimbursement of breast reduction.

Measurements have been proposed to predict breast tissue weight to be removed, showing a variable and often unsatisfactory correlation between preoperative and postoperative evaluation. We propose a reliable, simple measurement to predict the quantity of breast reduction in grams, valid for any surgical technique.

Material and Methods

128 patients, all undergoing bilateral breast reduction, were included in the study. Three different surgical techniques were used.

Results

Linear regression and Pearson test showed a high grade of correlation between preoperative NAC lift distance and weight of breast tissue removed. The ratio between grams of breast tissue and lift centimeters was explored to determine a mean value of breast weight. Mean resection weight was 686,65 grams. A straight correlation between nipple areola complex lift distance and weight of breast tissue removed was found using Pearson test and regression analysis.

Conclusions

NAC lift is a single, objective, repeatable measure, able to provide a reliable prediction of breast tissue grams to be removed and a proper indication for breast reduction.

9.00 NIPPLE SHIELDS AS ADDITIONAL TOOL TO POCKET IRRIGATION IN REDUCING CAPSULAR CONTRACTURE RATE AFTER COSMETIC BREAST AUGMENTATION

Salvatore GIORDANO, Asko SALMI, Turku, Finland

Background

Capsular contracture (CC) is the most commonly reported complication of augmentation mammoplasty, probably due to bacterial biofilms on breast implants arising chronic inflammation.

We investigated the effectiveness of nipple shields together with povidone-iodine-antibiotic irrigation of the breast pocket to prevent capsular contracture.

Material and Methods

The charts of 333 consecutive patients who underwent primary augmentation mammoplasty between 2009 and 2010 were reviewed. Patients underwent breast augmentation-mastopexy, secondary augmentation, revision, reconstruction, and not receiving pocket irrigation were excluded.

One hundred sixty-five women were included into the analysis and were divided into 2 groups on the basis of occlusive nipple shield use. All patients in the series underwent augmentation with the same surgeon via the inframammary approach, dual plane pocket, topical irrigation with a povidone-iodine-antibiotic solution.

Group A comprised 60 patients underwent augmentation receiving only pocket irrigation, while group B included 105 women underwent augmentation receiving occlusive nipple shields and pocket irrigation. Postoperative complications included occurrence of infection, hematoma, seroma, and CC.

Results

Mean (SD) postoperative follow-up in groups A and B was 38 (13) months and 34 (3) months, respectively. The postoperative superficial wound infection rate was 1.67% and 0.95%, the seroma rate was 0% and 1.9%, and the hematoma rate was 1.67% and 0.95% in groups A and B, respectively. Three CC cases (Baker grade 3 or 4) in group A and no cases in group B were reported (5% vs 0%).

Conclusions

Use of nipple shields with topical povidone-iodine and antibiotic irrigation might further reduce the CC rate in long-term periods.

9.10 AUTOLOGOUS AUGMENTATION MASTOPEXY WITH ANTERIOR INTERCOSTAL ARTERY PERFORATOR (AICAP) FLAP: VOLUMETRIC EVALUATION BY MAGNETIC RESONANCE IMAGING (MRI)

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Background

Breast volume depletion is an important cause of severe distortion of breast morphology. Particularly in some patients, such as bariatric patients, autologous augmentation may be a precious tool in mastopexy. The authors present their experience with the use of an anterior intercostal artery perforator (AICAP) flap in breast auto augmentation demonstrating flap viability and stability with MRI volumetric evaluation.

Materials and Methods

Twenty patients, affected by severe breast ptosis, underwent superior pedicle mastopexy with AICAP flap autoaugmentation in the last two years. The flap, including dermal and subcutaneous tissues above and below the inframammary fold, was islanded on intercostal perforators originating from V to VII intercostal spaces. At six months post-op flap and breast volume was evaluated with MRI. Sequences were scanned with SIEMENS Symphony (Munich, FRG). Images were acquired by NUMARIS/4 software (vers. Syngo MB A35) and evaluation was carried out by OsiriX © software (v. 3.0.2) Apple.

Results

No problems in flap viability were intraoperatively or postoperatively encountered, even in case of perforators' skeletonization. Flap harvesting did not add significant extra-time to mastopexy procedure. MRI confirmed flap viability and good symmetry with differences between two sides less than 3%. Flap volume ranged between 61 and 291 cm³ with a mean value of 150 cm³. Overall breast volume showed a 20% increase in average (range 15.5% - 29.4%). At 2 year follow-up no complication was experienced and the breasts presented long lasting good shape and projection with minimal ptosis recurrence.

Conclusions

AICAP flap seems to be a reproducible procedure that may represent a valid integration to classic mastopexy. MRI evaluation of volume is a useful tool to monitor flap viability, confirming, in our experience, AICAP flap effectiveness and stability.

9.20 OUTCOMES OF ACELLULAR DERMAL MATRIX FOR IMMEDIATE TISSUE EXPANDER RECONSTRUCTION WITH RADIOTHERAPY

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Background

Despite literature support for the use of acellular dermal matrix (ADM) in expander based reconstruction, its effect on clinical outcomes in the presence of radiation therapy (RT) has not been well described.

Material and Methods

A retrospective review was performed of consecutive patients who underwent immediate tissue expander (ITE) from 2004 to present at M.D. Anderson Cancer Center. Patients were categorized into four cohorts: total muscle coverage (TMC), TMC with radiation therapy (RT), ADM, and ADM with RT. Primary outcomes included: re-operation requiring expander exchange or loss, seroma, infection, delayed wound healing. Univariate and multivariate regression models were used to analyze for potential confounding variables.

Results

1379 patients underwent ITE reconstruction. 707 patients had TMC, 107 TMC with RT, 485 ADM, and 80 ADM with RT. Overall complication rate between ADM and TMC cohorts were 31.68% and 14.50% respectively ($p < 0.001$). Incidence of re-operation requiring exchange/loss of TE was higher in the TMC group overall, and highest in TMC with RT, with a trend towards statistical significance when compared to the ADM group (11.21% vs 5%, $p = 0.133$). Incidences of explantation were equivalent in both cohorts.

Conclusions

While overall complication rate, as well as incidence of infection and seroma appears to be higher in patients undergoing ITE with ADM and RT; if recognized and appropriately treated the expander reconstruction is often salvaged. The use of ADM, appears to play a protective role in preventing the need for re-operations and potentially explantations in patients undergoing RT.

9.30 TEN-YEAR RESULTS FROM THE NATRELLE® 410 ANATOMICAL FORM STABLE SILICONE BREAST IMPLANT CORE STUDY

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Background

Natrelle® 410 silicone gel breast implants were approved by the FDA on February 20, 2013, and the 10-year study supporting their approval has been completed. This publication updates the previously reported 6-year results.

Material and Methods

This prospective, pivotal, multicenter study enrolled 941 subjects: 492 augmentation, 156 revision-augmentation, 225 reconstruction, and 68 revision-reconstruction. Annual clinic visits collected complications, reoperations, explantations, and subject satisfaction, and one-third of subjects underwent biennial MRI rupture screening. Kaplan-Meier risk rates were calculated for all local complications, reoperations, and explantations.

Results

Capsular contracture rates increased approximately 1% per year from the previously reported 6-year rates to the final 10-year by-subject rates of 9.2% for augmentation, 11.9% for revision-augmentation, 14.5% for reconstruction, and 26.8% for revision-reconstruction (by-implant rates of 6.9%, 7.8%, 10.3%, 20.5%). These rates are significantly lower than those from the Natrelle® round gel core study (51% lower for augmentation and 59% lower for revision-augmentation). The overall rupture rate in the MRI cohort for all indications was 16.4% for subjects and 9.7% for implants. Eleven late seromas were reported (0.6% of study devices), and there was 1 occurrence reported of implant-associated ALCL. For both augmentation and reconstruction subjects the most common reason for explantation was subject request for size/style change. Satisfaction rates remained high through 10 years, with the percentage of subjects saying they were somewhat or definitely satisfied with their implants at 96.2% for augmentation, 87.5% for revision-augmentation, 93.3% for reconstruction, and 90.0% for revision-reconstruction.

Conclusions:

Natrelle® 410 anatomical form stable implants have demonstrated long-term safety and effectiveness, with low complication rates and high satisfaction rates.

9.40 LYMPHATIC DRAINAGE PATTERN OF RECONSTRUCTED BREAST WITH LATISSIMUS DORSI FLAP

Rosaria LAPORTA, Benedetto LONGO, Michail SOROTOS, Marco PAGNONI, Fabio SANTANELLI DI POMPEO, Rome, Italy

Background

Purpose: recurrence of breast cancer to latissimus dorsi (LD) flap donor site is a very rare condition and few data are currently available on its possible causes. A study of lymphatic mapping was performed to investigate the role of LD flap transfer in the regeneration of the lymphatic vessels and the lymphatic drainage involvement in local recurrence to flap donor site.

Material and Methods

On group of 10 patients, previously undergone modified radical mastectomy, axillary lymph-nodes dissection and immediate LD flap reconstruction, the lymphatic drainage was imaged by static gamma camera acquisitions after two subdermal injections of 37MBq ^{99m}Tc-Nanocoll® on residual breast skin and latissimus dorsi skin paddle, respectively.

Results

In 8 cases (80%) the residual breast skin showed fast lymphatic drainage directed only towards the ipsilateral axilla, while in 2 cases (20%) it was also seen in ipsilateral internal mammary nodes. LD skin paddle showed slower drainage towards the ipsilateral axilla in all cases (90%) but 1 (10%), where no visible drainage was observed within 2-hour after injection. In 8 patients (80%) only one sentinel lymph-node was detected at ipsilateral axilla, while in two patients (20%) was also registered at ipsilateral internal mammary nodes.

Conclusion

Our findings suggest that LD flap harvest can produce a preferential route of lymphatic drainage in axillary region. Although our results are not conclusive, it should not be excluded that LD flap can be involved in a metastatic spread to the dorsum through the axillary lymphatic route. Moreover, the direct communication created between recipient and donor sites could have lead to cell cancer transfer to donor site either by lymphatic or a contiguity pathway.

9.50 TOTAL AUTOLOGOUS BREAST RECONSTRUCTION USING THORACODORSAL SYSTEM FLAPS: PRELIMINARY EXPERIENCE

Michail SOROTOS, Benedetto LONGO, Corrado RUBINO, Fabio SANTANELLI DI POMPEO, Rome, Italy

Background

Purpose: autologous fat-transfer is an essential and useful adjunct to other methods of post-mastectomy reconstruction because of its low morbidity, longevity and easy application. Thoracodorsal system including the thoracodorsal artery perforator (TDAP) and latissimus dorsi (LD) flap can be considered as autologous matrices as they provides suitable recipient tissue for fat transfer, with a robust blood supply. The authors present their experience in total autologous breast reconstruction (TABR) using pedicled TDAP and LD flap coupled with immediate/delayed fat-transfer without implant.

Material and Methods

From 2009-2013, 14 patients underwent TABR, 12 were immediate and 2 delayed; among these 12 cases were unilateral reconstructions and 2 bilateral. TDAP and LD flap both combined with fat-transfer were used in 7 cases each one. The mean patients' age was 51.5 years (range, 42-62 yrs), while the body mass index was 25.3 kg/m² (range, 21.5-32 kg/m²). Fat was harvested using a Coleman-technique with 10-mL syringes, centrifuged at 3000 r.p.m. for 3 min and injected in the adipose-layer of LD flap/TDAP skin-paddle with 1-mL syringes.

Results

Mean harvested-size of skin-paddle was 20.6x9.1 cm (range, 13x5-39x14 cm). Mean operative-time was 2.95 hrs (range, 2.10-3.20 hrs) and 4.12 hrs (range, 4.10-4.15 hrs) respectively for unilateral and bilateral reconstructions. Immediate fat-injection was performed in all flaps with mean harvested-volume of 141.42mL (range, 60-240mL), and mean injected-volume of 105.7mL (range, 40-170mL). At mean follow-up of 16.07-month, 2 cases required an additional fat-transfer, while delayed fat-injection respectively of 240 cc and 280 cc was performed in 2 TDAPs. All flaps healed uneventfully, no seroma occurred in flap donor site and no fat grafting-related complications were observed.

Conclusions

Thoracodorsal system coupled with immediate/delayed fat-transfer is an innovative option for TABR in small to medium breasted patients avoiding implant-related complications, and can be considered as first option when abdominal tissues are not available.

10.00 AUTOLOGOUS FAT GRAFTS TO DIFFERENT LAYERS IN THE BREAST: COMPARING SUBCUTANEOUS TO INTRAMUSCULAR GRAFTING IN INNERVATED AND DENERVATED MUSCLE TO OPTIMIZE FAT TAKE, QUALITY AND PERMANENCY IN RODENTS

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Background

In plastic surgery of the breast, lipofilling is currently representing one of the most frequent procedures.

For the most part, the surgeons did not focus on one special recipient tissue, which may be due to the lack of any guidelines so far. There is no consensus of the advantages and disadvantages of the subcutaneous versus the intramuscular layer for the fat grafting.

Until now, animal experiences in this field of research were mostly carried out in less relevant environments, i.e. the ear or the front, even though the mammary region is one of the most important fields for autologous fat grafting in humans. In order to get closer to the clinical setting, we decided to examine the pectoralis muscle and the adjacent subcutaneous tissue for autologous fat grafting and to analyse the impact of innervation versus denervation of the muscle to optimize fat take, quality and permanency.

Materials and Methods

In female Sprague Dawley rats (6 groups of 7 rats, 8 weeks old), fat grafts of 0.3ml, harvested from the inguinal fat pad, were implanted in the same animal in the subcutaneous or in the intramuscular layer of the breast area, respectively. In two of the subgroups, neurotomy or botulinum toxin injection was carried out in order to cause a constant or temporary denervation.

In one animal per subgroup, the fat lump was pretreated with the cell tracking dye PKH26 for long term in vivo cell tracking. Time points for the final evaluation were determined on 2 and 6 weeks.

The final assessments included MRI analysis for volumetrics and for the calculation of a muscle-fat-ratio; histological evaluation of the Hematoxylin and Eosin stained tissue samples with regard to the area of the remaining fat implant, cell viability, oil cysts, calcification, fibrosis, inflammation and neovascularisation; and fluorescence microscope examination of the PKH26 stained tissue for cell viability and cell count.

Results

Preliminary results show reduction of the volume from the first to the second time point in all groups. Interestingly, the botulinum toxin group showed considerably higher fat take over time. We expected a better fat cell viability and hence fat graft quality and longevity in the denervated muscle, as the pressure induced by contraction is omitted. This should also find expression histologically in a higher ratio of viable fat cells and lesser inflammation and fibrosis.

Conclusions

We hence hope to elucidate whether general advice can be given in which tissue layer autologous fat grafts in the breast area should be placed.

10.10 FURTHER OPTIMIZATION OF AUTOLOGEOUS BREAST RECONSTRUCTION USING THE FAST TRACK METHODOLOGY

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Background

We recently presented our experience with fast track surgery in autologeous breast reconstruction¹. We demonstrated that a simple, perioperative care concept could reduce the length of stay (LOS) after a DIEP flap procedure from 7.4 days to 6.2 days without increasing complication rates or flap loss. The aim of the present study was further improvement of the protocol and to identify specific clinical and logistical factors that keep patients in hospital.

Material and Methods

We performed a total revision of our patient information. Multimodal analgesia was used with paracetamol, a COX-2 inhibitor, and gabapentin. Nurses removed suction drains without consulting the doctors. Fulfilment of functional discharge criterias (flap monitoring, ambulation etc) were assessed twice daily and specified reasons for not allowing discharge registered.

Results

At present (February 2014), 14 patients have been treated using the new paradigm. All patients were discharged on the third postoperative day (POD) except one who was released on day 4. Follow-up (4 weeks) revealed that none of the patients had been reoperated and all flaps survived with no major complications except one case of partial flap necrosis. All drains were removed on 2nd or 3d POD. Median VAS score at discharge was 1 (range 0-4). 100 % of the patients were pain free, ambulating, eating and managing personal hygiene on the morning of POD 2, 100% were mobilized by afternoon POD 2. The data from the first 20 patients will be presented along with our revised protocol and analysis of the factors that keep the patients in hospital.

Conclusions

LOS after autologeous breast reconstruction using DIEP flaps can be reduced to about 3 days using the fast track methodology. Thorough patient information and close cooperation with the nursing staff are essential to the success.

10.50 SURGICAL TECHNIQUES IN CLOSED RHINOPLASTY OF A BIG, MASSIVE, BOXY OR BULBOUS NOSE

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Background

The problem of reduction of a massive, broad nose with wide nostrils remains one of the most challenging and urgent items for most surgeons who perform aesthetic rhinoplasty. Thus important advantages of a closed rhinoplasty in a bulky nose problem solution frequently aren't taken into consideration and even ignored by many specialists in this field. We would like to review the surgical methods we use when correcting a bulbous nose with slack, loose skin, often porous, with the marked subcutaneous tissue and a thick epithelial layer. These endonasal methods help to reduce the size of a skin envelope and create a more refined, accurate, well-defined nasal tip.

Materials and methods

We are going to review the following:

1) Endonasal approach as an important and necessary condition of using additional advanced surgical techniques when enhancing a massive nose; 2) Importance of preserving and creating extra strength and resiliency for the nasal tip cartilaginous framework; 3) The techniques for creation the conditions, which are necessary for the thin atrophic subcutaneous scar formation in the nasal tip; 4) Nasal skin peculiarities and their impact on the rhinoplasty outcomes; 5) Osteotomy of a massive nose; 6) Airway dysfunction treating in aesthetic rhinoplasty; 7) Modifying bulky, wide nostrils and using various cut out patterns of a skin nasal envelope; 8) Cartilaginous tip grafts and a thick nose reduction; 9) Anthropometrical compensations for the camouflage of a big nose; 10) Wide nasal base reduction; 11) Suture techniques for a boxy nasal tip; 12) Diprosan (Betamethasone) in rhinoplasty: the prons and cons; 13) Complications of a bulbous nose rhinoplasty: how to avoid them; 14) Injectables and medico-surgical approach in rhinoplasty.

Conclusions

Today valuable advantages of a closed big nose rhinoplasty are unfairly forgotten or insufficiently researched. Meanwhile, endonasal rhinoplasty helps and opens expanded horizons and extra possibilities for surgeons when operating on such noses.

11.00 ORBITAL FLOOR FRACTURES RECONSTRUCTION UNDER LOCAL ANAESTHESIA.

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Background

Orbital blowout fractures can be engaged by several surgical specialities including plastic and maxillo-facial surgery, otolaryngology and ophthalmology. Indications to treatment depend on the combination between signs/symptoms and imaging in order to evaluate muscle/nerve entrapment and periorbital tissue herniation.

Materials and Methods

A retrospective chart review was performed for isolated orbital floor fractures treated at the Department of Maxillo-Facial Surgery of Florence between May 2011 and July 2012. One hundred thirty-five patients met the inclusion criteria and all underwent reconstruction under local anaesthesia.

Results

Surgery was performed within the first five days (mean = 3.1 days; range: 1 to 5 days) from the date of injury. The overall hospital stay ranged between 1 and 3 days (average, = 2.6 days). All patients underwent surgery with an infraorbital nerve block and subciliary anaesthesia combined with conscious sedation when the fracture involved the posterior floor. The surgical outcome was comparable to the outcome achieved under general anaesthesia. There was a lower rate of surgical revisions due to concealed malposition or entrapment of the inferior rectus muscle (19% vs 22%). However, this result was not statistically significant ($P > 0.05$).

Conclusions

There are several advantages to surgically repairing isolated orbital floor fractures under local anaesthesia including intraoperative assessment of reconstructive outcome (enophthalmos and extrinsic ocular muscles function) reduced re-operation rate, rapid discharge and decreased overall costs. Most patients tolerated orbital reconstructive surgery comfortably, safely and with minimal pain suggesting that reconstruction of the orbital floor performed under local is safe and well tolerated.

11.10 TWO-YEAR EVALUATION OF EITHER BILOBED FLAP OR FULL THICKNESS SKIN GRAFT AS A CLOSURE TECHNIQUE OF THE NASAL TIP

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Background

There is no clarity if a bilobed flap is the best treatment of choice for reconstruction of nasal tip defects.

Material and Methods

The nose of twenty patients was photographed 2 years after surgical excision of skin cancer and closure either with a bilobed flap (n=7) or a full thickness skin graft (n=13). Photographs were assessed by 2 dermatologists, 2 plastic surgeons and 2 non medically trained individuals, applying the POSAS scale.

Results

There were no significant differences between opinions of the two techniques. Overall, on a scale from 0 to 10 where 0 means 'no visual abnormalities' the bilobed flap scored 2.22 versus 2.33 for the skin graft. Where medical consultants preferred the bilobed flap, non medical individuals favored the skin graft closure.

Conclusions

We found no evidence to support the textbook statement that the bilobed flap "excels" for reconstruction of defects less than 1.5 cm around the nasal tip.

11.20 FREE RADIAL FOREARM FLAP VERSUS PECTORALIS MAJOR MIOCUTANEUS FLAP IN TONGUE RECONSTRUCTION: EVALUATION OF TONGUE RECOVERY

Pasquale GRAZIANO, Fabio ASTARITA, Alfonso ALBERICO, Fabrizio SCHONAUER, Giovanni DELL'AVESANA ORABONA, Luigi CALIFANO, Naples, Italy

Background

Oral cancer is the sixth most common cancer in the world. The extensive surgical resection and radiotherapy, leads often to a worsening of oral and tongue functions. Pectoralis major myocutaneous flap (PMMF) and free radial forearm flap (FRFF), have been often proposed for repair of post-operative defects in order to achieve a better restoration of oral functions. The aim of our study is to compare postoperative tongue mobility - focusing on the evaluation of speech, chewing and swallowing - in patients, reconstructed with these two different techniques after surgery for tongue cancer removal and eventual underwent adjuvant radiotherapy.

Material and Methods

Between January 2002 and December 2012 we evaluated 139 patients operated for squamous cell carcinomas of tongue. All patients was divided into three groups depending on the surgical procedure, total hemiglossecomy (S1) anterior hemiglossectomy (S2) and posterior hemiglossectomy (S3). We evaluated postoperative tongue recovery in patients reconstructed with two different techniques, FRFF and PMMF, after surgical resection and eventual underwent adjuvant radiotherapy.

Results

No significant differences were found in mean speech intelligibility, swallowing and chewing between patients reconstructed with RFF (23) or PMMF (26), in patients with S3 resection (49). In the S1 (50) and S2 (40) groups the tongue mobility was better in terms of speech and swallowing in those patients reconstructed with free radial forearm flap (45). These differences were less evident in patients that underwent postoperative radiotherapy.

Conclusions

In our study the FRFF was a better technique to preserve tongue motility ; nevertheless, when it is not possible to harvest such flap, the pectoralis major miocutaneous flap could offer a valid alternative. In term to restore the tongue function the FRFF was a better tecnique for the anterior hemiglossectomy , while FRFF and PMMF were similar for posterior hemiglossectomy. Radiotherapy does reduce functional outcomes in all cases.

11.30 AN ALTERNATIVE AND PRACTICAL APPROACH TO HARVEST THE FACE AND SCALP ALLOGRAFT AS A SINGLE UNIT

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Background

Composite allotransplantation like facial allotransplantation is one of the most attractive transplantation procedure recently. In this study, we are describing territories of total face and scalp allotransplantation including various anatomical structures to improve the quality of the allograft.

Materials and Methods

Six fresh cadavers were used for dissection. After the neck incision, sternocleidomastoid muscle was cut to expose external carotid arteries and internal jugular veins bilaterally. A midline scalp incision was made extending from the anterior hairline to the posterior neck. The scalp was dissected starting from the posterior and the occipital muscles were included and elevated subperiosteally to protect the occipital vessels. Facial dissection was also performed subperiosteally from cranial to caudal direction. The eyelids and the punctolacrimal system, bilateral auricles and the facial nerve trunks were included. The mucosa was incised at the gingivobuccal sulcus and corpus osteotomies were performed at the mandibula to better identify external carotid artery branches. The V3 was followed in the inferior alveolar canal and together with V2, a long segment was dissected to be included in the allograft. The neck dissection was performed subplatysmally in the anterior neck. The vascular territories of the allograft was confirmed with methylene blue dye and indocyanine green angiography.

Results

The average time for face-scalp allograft harvest was between 6 to 9 hours. The allograft included the facial skin, nasal lining and the bony skeleton of the nose, eyelids, lips, parotid glands, neck, scalp with the pertinent arteries, veins, and nerves. The occipital muscle dissection was the most technically demanding part of the dissection. The occipital vessels were required to perfuse the posterior scalp which was clearly demonstrated by the injection studies.

Conclusions

In this study an alternative and practical approach to harvest a total face and scalp allograft was described. According to the literature, it was assumed that facial vessels were sufficient to perfuse the total face and scalp. We believe that if scalp is included in the allograft the occipital vessels should also be included in the graft. The injection studies demonstrated that the scalp is clearly perfused when the occipital vessels are included. Besides, we have performed dissection of the V2 and V3, and splitted the alveolar canal to harvest a longer nerve segment. The punctolacrimal system was also harvested as a single unit to provide a functional lacrimal system.

11.40 FUNCTIONAL AND ANATOMICAL BASIS FOR BRAIN PLASTICITY IN FACIAL PALSY REHABILITATION USING THE MASSETERIC NERVE

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Background

Several techniques have been described for smile restoration after a facial nerve paralysis. Depending on the palsy origin and its time of evolution, the patient may require a muscle transfer, either free or a transposition, a nerve graft/transposition or both. When using a nerve other than the contralateral facial nerve to restore the smile some controversy appears because of the non-physiologic output of the smile. Different authors reported natural results with the masseter nerve. The physiological pathways of why this can be achieved remain unclear.

Material and Methods

A functional magnetic resonance was performed on 24 healthy subjects (13 males and 11 females) to depict cortical activation pattern while smiling and jaw clenching. Connectivity of these regions was also studied.

Results

The imaging results showed similar brain activity for smile and jaw clenching tasks. Smile activation was higher than clenching, showing a much overlap.

Conclusions

The hypothesis of brain plasticity between the facial nerve area and masseter nerve area is supported by the overlapping activity showed in this experiment. Differences in connectivity may help to explain different clinical results reported between men and women.
