



Dipartimento Integrato Interistituzionale
DIPINT



Primo Workshop
Clinical Research and Innovation

Venerdì 4 luglio 2014 9,00 - 19,00
Aula Magna - Polo Fibonacci - Largo Pontecorvo 3, Pisa

New strategies for bone regeneration and modeling in otologic and orthopedic surgery

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New Banked Bone Prostheses for Otologic Surgery



Berrettini S, Danti S, De Vito A, Bruchini L, Forli F, Stefanini C



Homologous femoral cortical bone



New Banked Bone Prostheses for Otologic Surgery



CLINICAL STUDY on 25 patients (15 M ,10 F). Follow-up at 12 -36 months (mean 25 months):

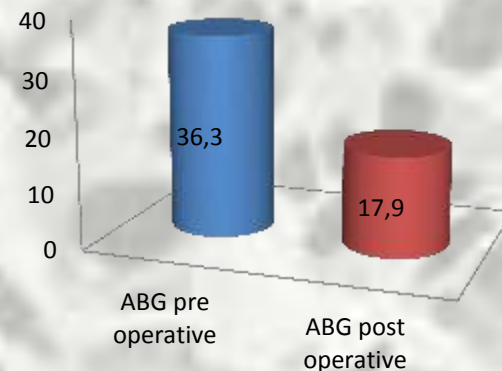
Mean preoperative ABG was 36.3 dB (range 15.00-50.75) SD 9.72

Mean post-operative ABG 17.9 dB (range 2.75 - 36.25 dB) SD 9.46

Mean Gain 18.4 dB

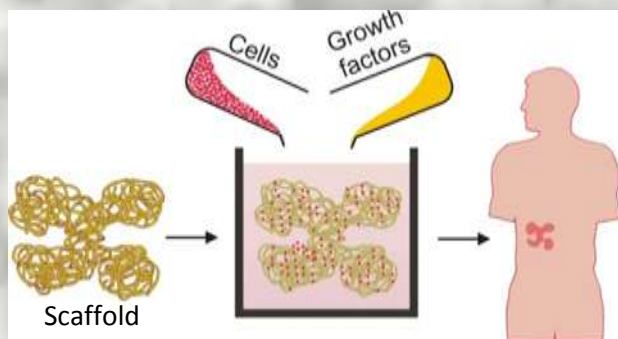
ABG < 20dB in 64% of cases (16/25)

No resorption, No extrusion, No bone fixation

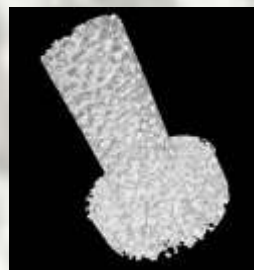


Tissue-Engineered Ossicular Prostheses

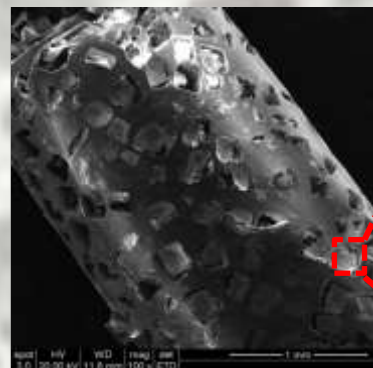
Berrettini S, Danti S, D'Alessandro D, Trombi L, Petrini M



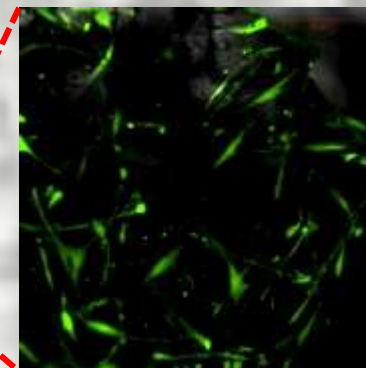
Tissue Engineering



**Porous
PORP-scaffold**



**Extracellular
Matrix**



Viable cells

Mesenchymal Stem Cells (MSCs) from Bone Marrow Aspirates in the Treatment of Long Bone Pseudarthrosis

Parchi P, Lisanti M



1. Sampling From The ILIAC CREST



2. Transfer to a test tube.



3. Centrifugation and separation



4. Collection and concentration of MSC



5. MSC are mixed with demineralized bone matrix



Mesenchymal Stem Cells (MSCs) from Bone Marrow Aspirates in the Treatment of Long Bone Pseudarthrosis

Parchi P, Lisanti M

From January 2009 to May 2013

27 cases of long Bone Pseudarthrosis

Extracell BMC-marrow aspirate protocol of Regen Lab



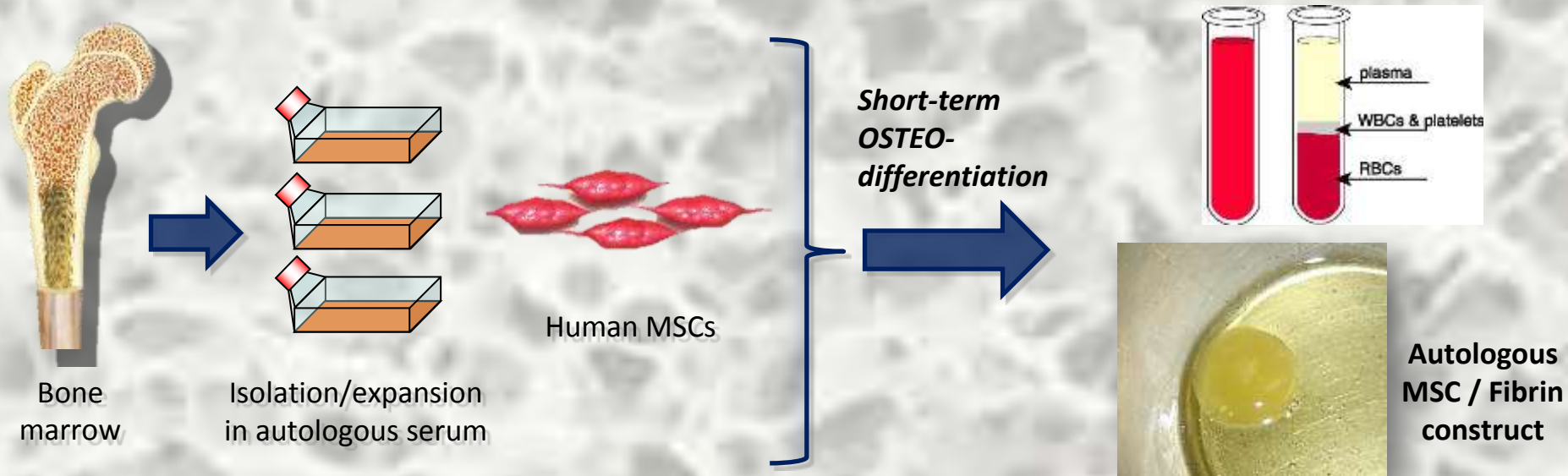
RESULTS

Radiographic investigation shows complete healing in 75% (20 cases) with an average time to healing of 4.9 months (complete remission of symptoms)



Upper limb non-unions treated with autologous MSC / fibrin clot constructs

Giannotti S, Trombi L, Bottai V, Ghilardi M, Petrini M, Guido G



- Years 2004-2007: Limited number (8 cases: 4 M, 4 F; mean age 44 years; range 18–73 years) of **compassionate therapies** (1 or more surgical interventions with unsatisfactory outcomes and no alternative therapy was available)
- upper limb revision surgery for atrophic pseudarthrosis
- Implanted with **autologous MSC/fibrin scaffold constructs**.

Upper limb non-unions treated with autologous MSC / fibrin clot constructs

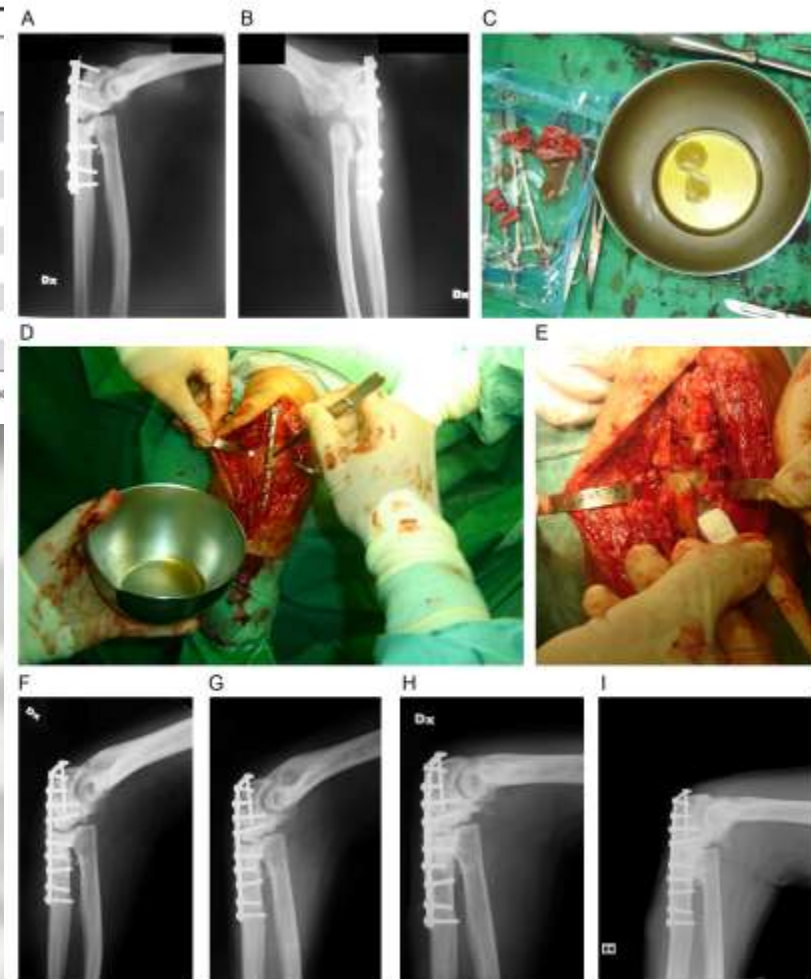
Giannotti S, Trombi L, Bottai V, Ghilardi M, Petrini M, Guido G

Table 2. Details of MSC/fibrin clot construct implant and of post-implant healing.

Patient	Number of interventions	Number of constructs implanted	Bone substitute	Time of radiographic healing (months)
F. 45	1	2	Autologous bone graft from iliac crest	5.0
M. 27	1	5	Banked homologous bone and allonmatrix	3.5
F. 73	1	6	Autologous bone graft from iliac crest, synthetic bone chips	5.0
M. 61	1	4	Homologous bone chips (Osteotech)	10.0
M. 51	1	2	Synthetic bone chips	7.5
M. 46	1	5	Autologous bone graft from iliac crest	6.0
F. 18	1	4	Autologous bone graft from iliac crest	5.0
F. 31	1*	2+2 (ulna+radius)	Banked homologous bone	6.0
	1**	1+4 (ulna+radius)	Autologous bone graft from iliac crest	6.0

*A partial healing of the ulna was observed after the first intervention, while the radius still presented atrophic pseudarthrosis. **Complete healing of the ulna and radius) occurred only after the second intervention.

- Radiographic healing was evaluated with short- and long-term follow-ups (range averages: 6.7 and 76.0 months).
- All patients recovered limb function, with no evidence of tissue overgrowth or tumor formation.



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Use of Autologous Human mesenchymal Stromal Cell/Fibrin Clot Constructs in Upper Limb Non-Unions: Long-Term Assessment

Stefano Giannotti^{1,2}, Luisa Trombi^{2,3}, Vanna Bottai¹, Marco Ghilardi¹, Delfo D'Alessandro³, Serena Danti², Giacomo Dell'Osso¹, Giulio Guido¹, Mario Petrini²

General Conclusions

- It is estimated that 3.1 million people per year undergo implantation of an exogenous material or device.
- The global biomaterials/medical devices market is estimated at 110 € billions.
- Joint endoprostheses, fracture management devices and other implants are about 10% of the market (11€ billions).
- Device implants carry the risk of failure due to biological incompatibility, infections, wear and loosening.
- There is urgency of advanced strategies for bone replacement that minimize adverse reactions and/or promote tissue formation or implant integration.
- New strategies are expected to be of great social and economic significance.
- Our studies demonstrate that:
 - The use of homologous bone can be efficiently tailored to the needs of otologic surgery using advanced micromechanical technologies;
 - Orthopedic surgery can take great advantage of autologous bone marrow MSCs combined with supportive scaffolds.
- For clinical success, the tight partnership between government authorities, research institutes and industry is mandatory.