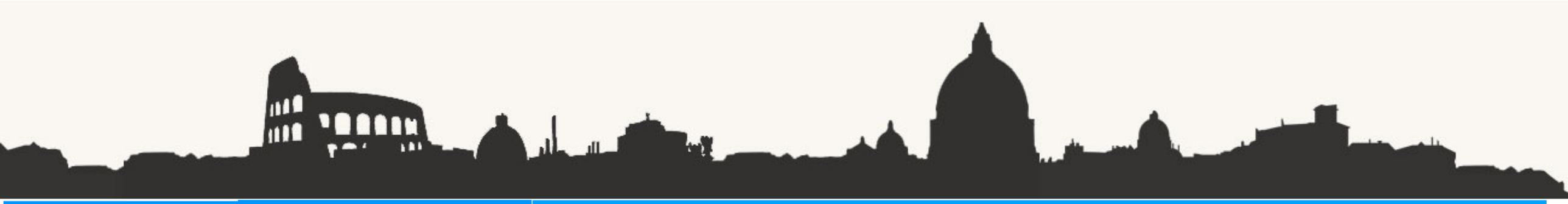

Fabio Valerio Sciarretta

Italy

One-Stage Cartilage Repair By Lipo-Amic Technique: Stable Results At 5 Years Follow-Up

FABIO VALERIO SCIARRETTA

Member - ICRS General Board
SICOT Editorial Secretary
Chair – SICOT Orthobiologics Task Force
Chair – SICOT Sports Committee
Chair – SICOT Rehab Committe
Co-Chair – ISAKOS Biologics Task Force
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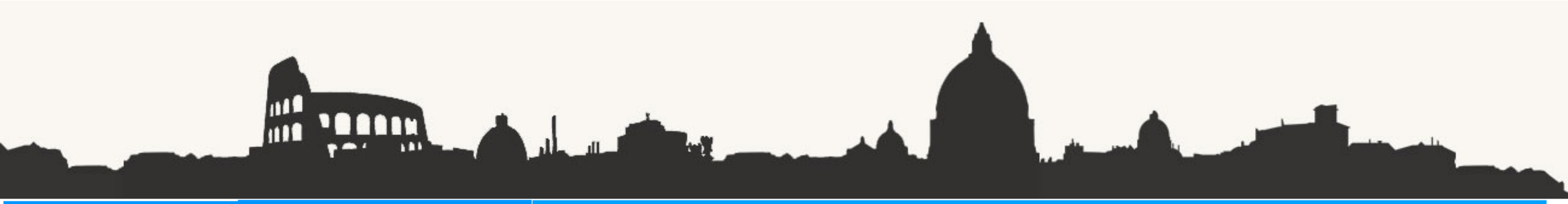


Fabio Valerio Sciarretta

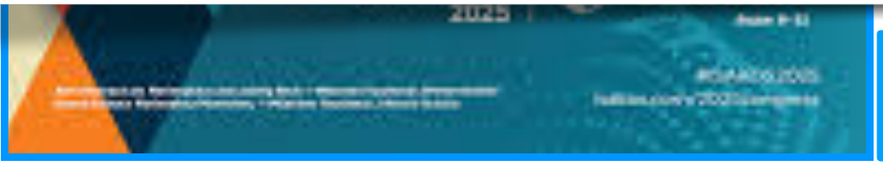
Italy

One-Stage Cartilage Repair By Lipo-Amic Technique: Stable Results At 5 Years Follow-Up

FABIO VALERIO SCIARRETTA

- I have no relevant financial relationships to disclose

-I will not be discussing the off-label or investigational use of products



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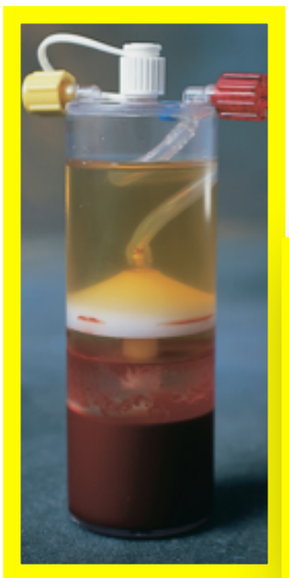
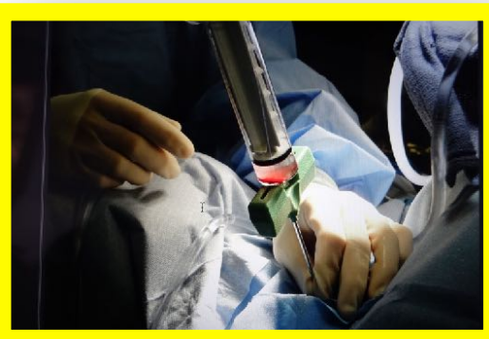
Matrix Associated MF

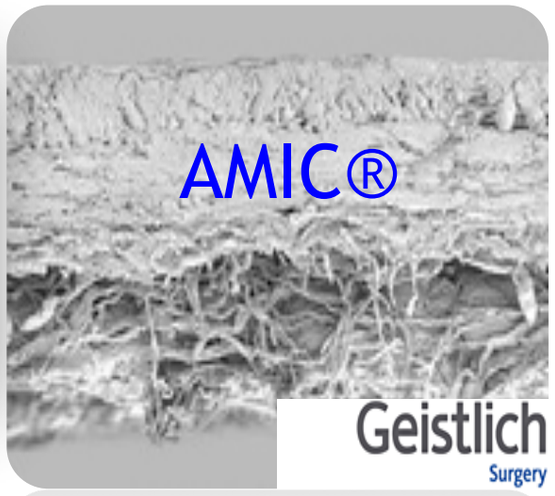
Cells



PRP



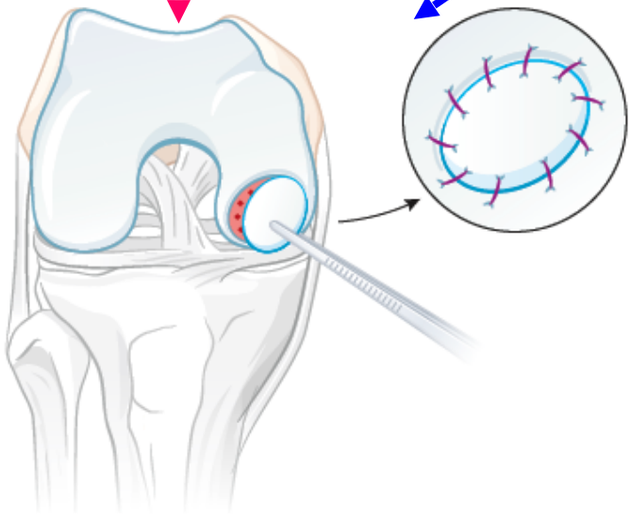
Mach



Membrane

Bone Marrow
Concentrate
BIO-Mac

Adipose
Tissue



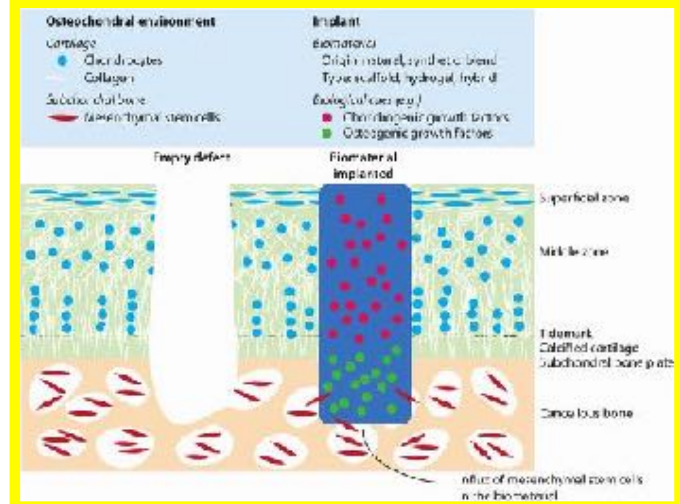
Improved cartilage regeneration by implantation of acellular biomaterials after bone marrow stimulation: a systematic review and meta-analysis of animal studies

2016-2017 systematic reviews on biomaterial augmented BMS

Augmented cartilage regeneration by implantation of cellular versus acellular implants after bone marrow stimulation: a systematic review and meta-analysis of animal studies

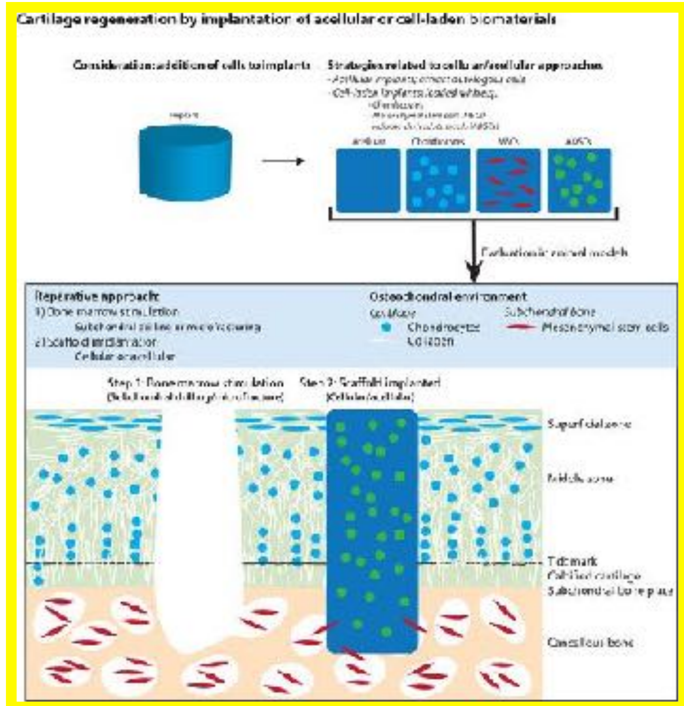
Published October 27, 2017

- Cartilage regeneration is more effective by implantation of acellular biomaterials in microfracture defects compared to microfracturing alone



- The efficacy is further improved by the incorporation of biologics.

- cartilage regeneration using ADSCs-seeded scaffolds improved regeneration compared to acellular scaffolds.

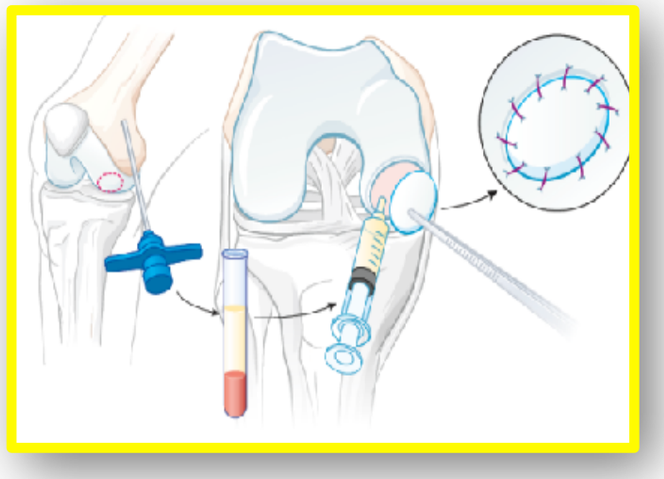


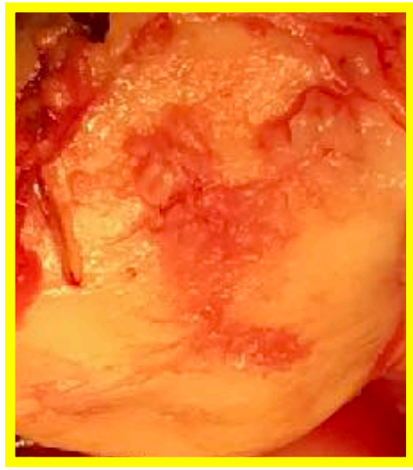
- **AMIC - BM AMIC**

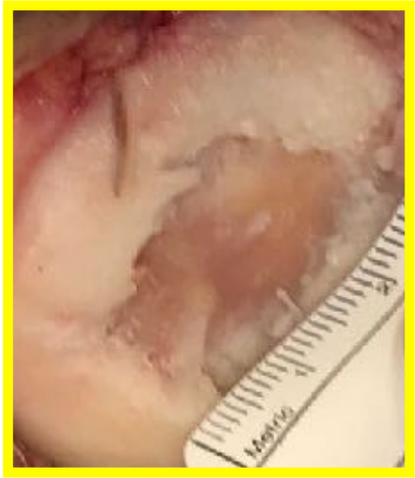
  TO ADIPOSE AUGMENTED AMIC

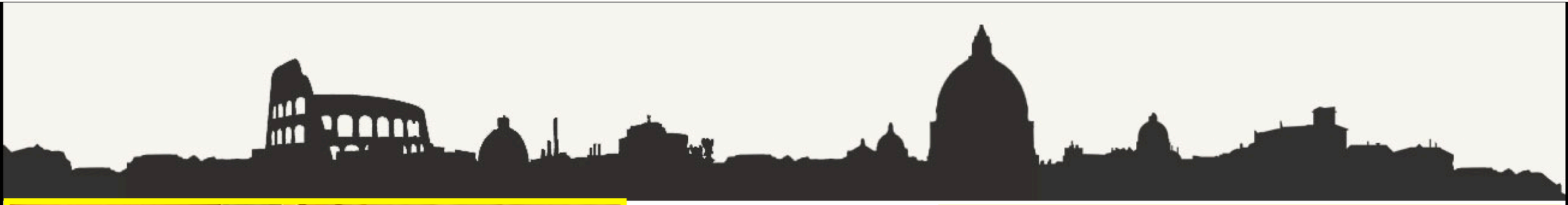
SCIARRETTA'S LIPO-AMIC TECHNIQUE

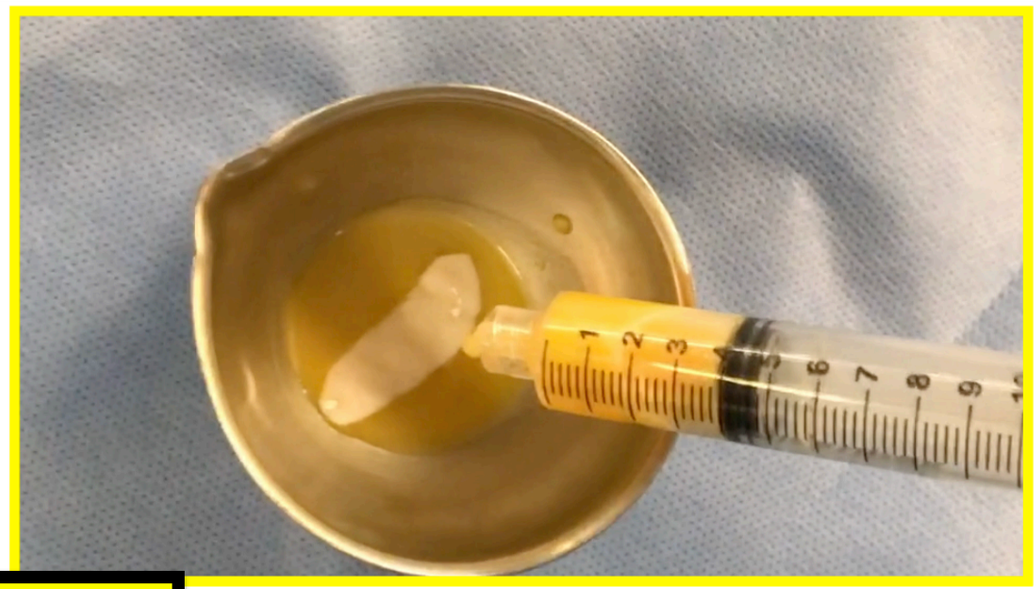
LIPO-AMIC



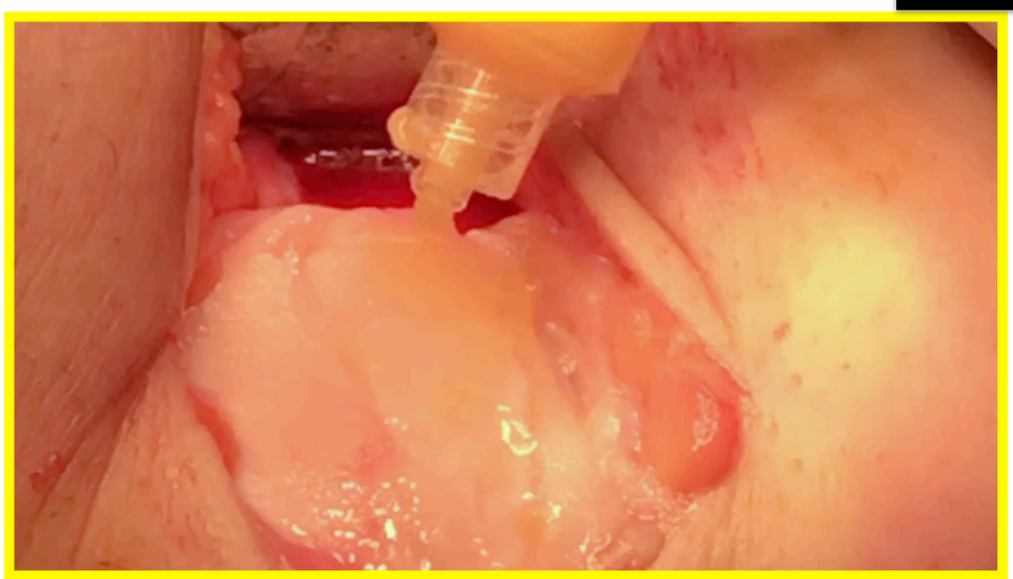








LIPO-AMIC cartilage repair procedure

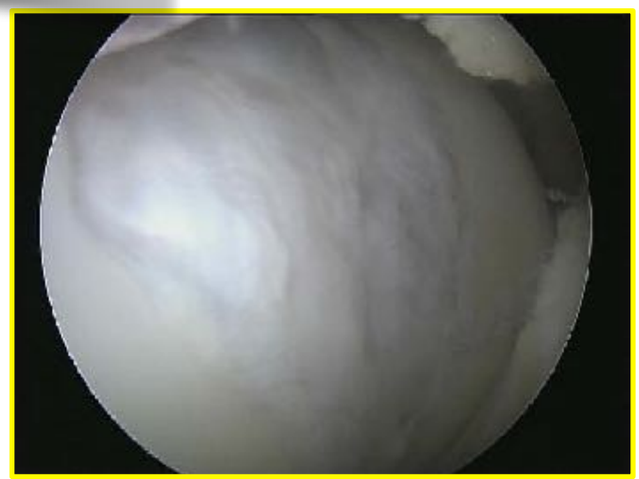


LIPO-AMIC Case Report

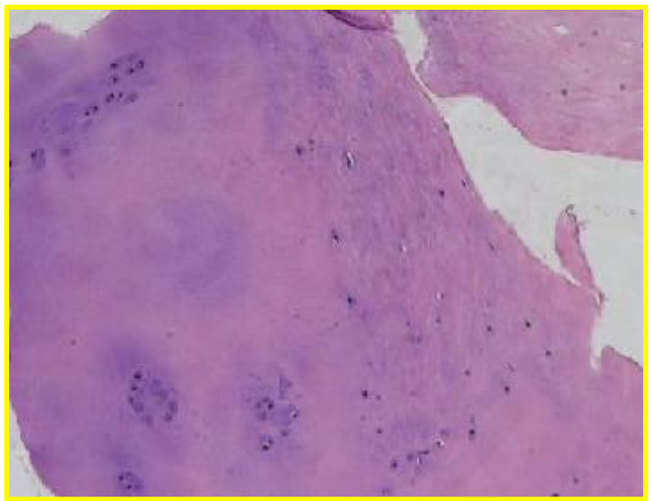
43-year-old man

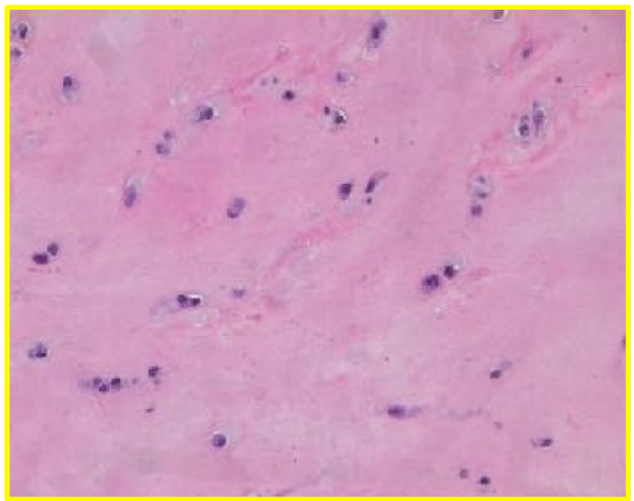
Surgical case THROCLEA

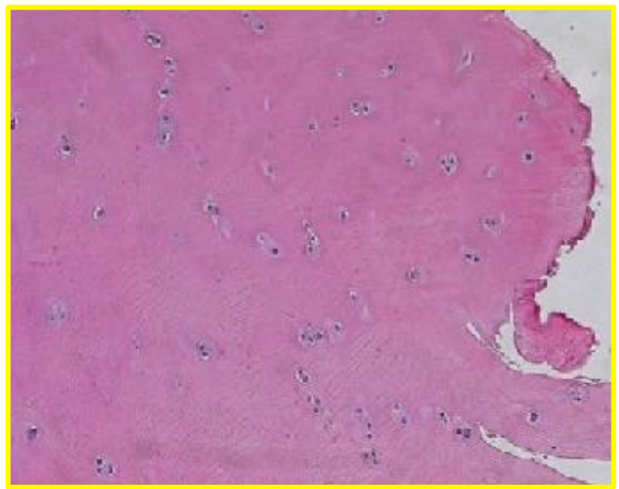
24 months follow-up



SECOND-LOOK 24 months follow-up







HISTOLOGIC 24 months follow-up

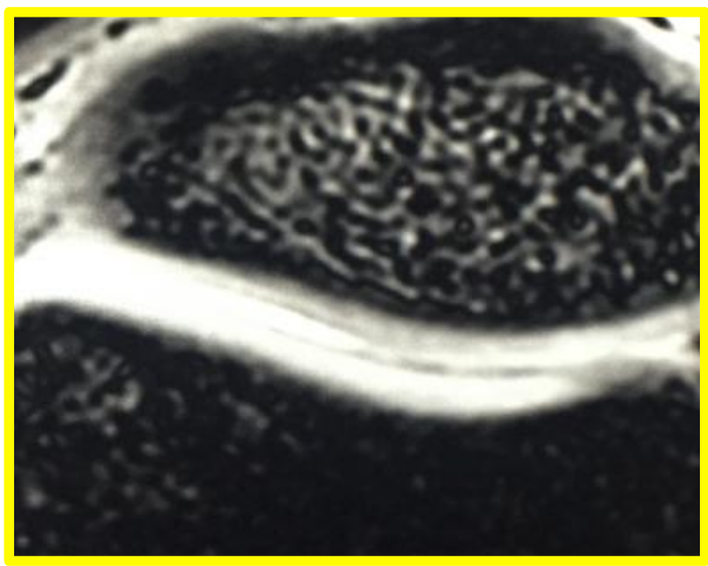
MRI 24 months follow-up

LIPO-AMIC Case Report

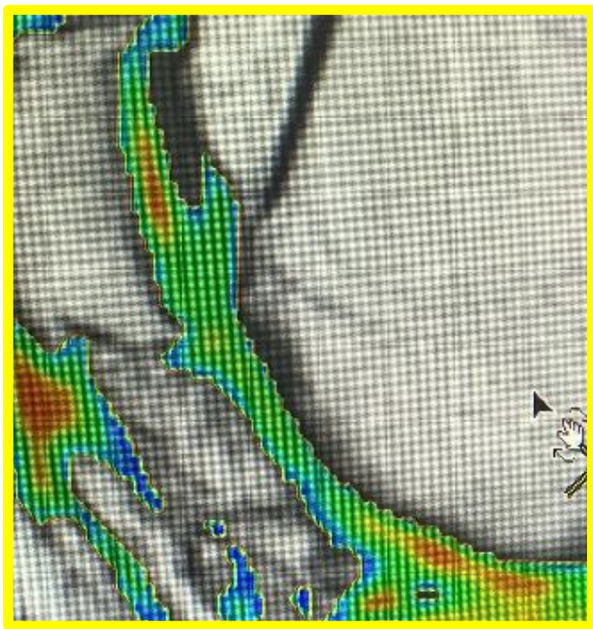
43-year-old man

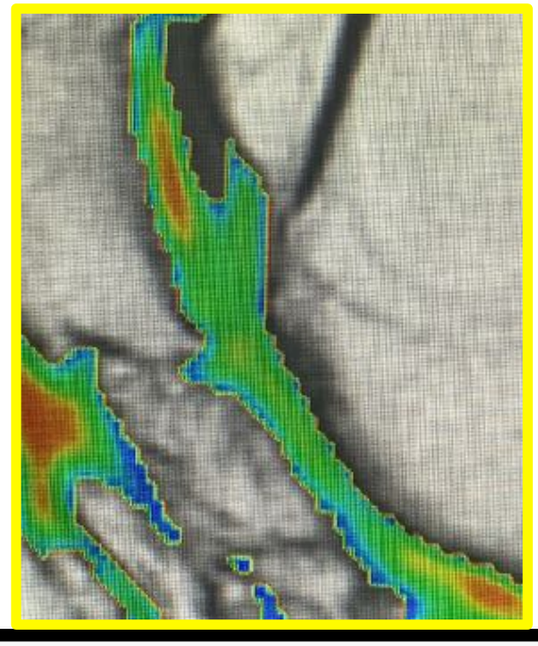
Surgical case THROCLEA

60 months follow-up

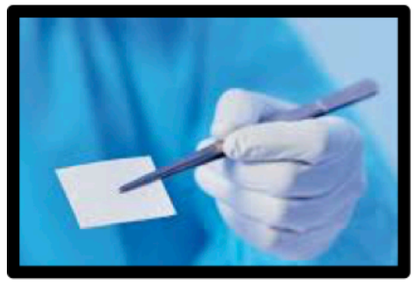


MRI 60 months f-up





T2 MAPPING 60 months follow-up



OUR EXPERIENCE

Orthopaedic Proceedings

USE OF ADIPOSE MESENCHYMAL STEM CELLS FOR AUGMENTED AMIC ONE-STEP CARTILAGE REPAIR TECHNIQUE IN THE KNEE

F.V. Sciarretta
Published 1 March 2017

Article | Info & Metrics | eLetters

Abstract

PURPOSE Recently, in tissue engineering several methods using stem cells have been developed to repair chondral and osteochondral defects. Most of these methods rely on the use of scaffolds. Studies in the literature have demonstrated, first in animals and then in humans, that the use of mesenchymal stem cells withdrawn by several methods from adipose tissue allows to regenerate hyaline articular cartilage. In fact, it has been cleared that adipose-derived cells have multipotentiality equivalent to bone marrow-derived stem cells and that they can very easily and very quickly be isolated in large amounts enabling their immediate use in operating room for one-step cartilage repair techniques. The purpose of this study is to evaluate the therapeutic effect of adipose-derived stem cells on cartilage repair and present our experience in the treatment of knee cartilage defects by the novel AMIC REPAIR TECHNIQUE AUGMENTED by immersing the collagen scaffold with mesenchymal stem cells withdrawn from adipose tissue of the abdomen.

MATERIALS AND METHODS Fat tissue processing involves mechanical forces and does not mandatorily require any enzymatic or chemical treatment in order to obtain the regenerative cells from the lipoaspirate. In our study, mesenchymal adipose stem cells were obtained by non-enzymatic filtration or microfragmentation of lipoaspirates of the abdomen adipose tissue that enabled the separation of the stromal vascular fraction and were used in one-step reconstruction of knee cartilage defects by means of this new AUGMENTED AMIC TECHNIQUE.

ARTICOLO ORIGINALE

Giornale Italiano di Ortopedia e Traumatologia
2017;43:1-7

LIPO-AMIC: descrizione tecnica e studio pilota su 18 pazienti della tecnica amic modificata con aggiunta di cellule mesenchimali da tessuto adiposo

LIPO-AMIC: technical description and eighteen pilot patients report on amic technique modified by adipose tissue mesenchymal cells augmentation

Fabio Valerio Sciarretta[1,3] *(foto)*
Claudio Ascani[2],
Carolina Fossati[3],
Silvana Campisi[3]

[1] Clinica Nostra Signora della Mercede, Roma; [2] UOC I Traumatologia I.P. Chirurgia della Spalla e del Gomito, Ospedale CTO, Roma; [3] Accademia Biomedica della Rigenerazione, Clinica Assunzione di Maria Santissima, Roma

Riassunto

Questo studio pilota descrive le fasi tecniche della tecnica chirurgica ed i risultati preliminari della tecnica AMIC (autologous matrix-induced chondrogenesis) modificata con l'aggiunta delle cellule mesenchimali autologhe da tessuto adiposo, definita come tecnica LIPO-AMIC, per il trattamento dei difetti della cartilagine ginocchio. La tecnica LIPO-AMIC è stata utilizzata per il trattamento dei difetti focali sintomatici di III e IV grado secondo la classificazione ICRS del ginocchio. Diciotto pazienti sono stati valutati prospetticamente nel corso di due anni, sia clinicamente che mediante la valutazione con risonanza magnetica. I pazienti hanno mostrato un significativo miglioramento clinico progressivo di tutti i punteggi (IKDC, Lysholm, Koos e VAS) già a partire dal follow-up iniziale a 6 mesi dalla esecuzione della procedura LIPO-AMIC e gli scores sono ulteriormente i aumentati sono stati notati fino all'ultimo follow-up a 24 mesi dopo l'intervento. I controlli di RM hanno mostrato la precoce ricrescita della lamina subcondrale, la progressiva maturazione del tessuto di riparazione ed il progressivo riempimento dei difetti. In conclusione, la possibilità di ottenere un grande numero di cellule mesenchimali vitali da tessuto adiposo, con clusters e nicchie vascolo stromali intatte, con capacità condrogenica e paracrina elevate insieme all'uso di una membrana collagenica in grado di trattenere le cellule in situ e favorirne la trasformazione condrogenica, rendono ragione dei significativi miglioramenti riscontrati nei pazienti da noi trattati e consentono di convalidare questa tecnica quale procedura one-step semplice, sicura ed efficace per la riparazione dei difetti cartilaginei articolari.

Parole chiave: tecnica LIPO-AMIC, cellule mesenchimali da tessuto adiposo, difetti condrali ed osteocondrali, medicina rigenerativa

Summary

This pilot study describes the technical steps of the surgical technique and the preliminary outcomes of autologous matrix-induced chondrogenesis (AMIC) combined with autologous adipose tissue derived stem cells, defined as LIPO-AMIC, for the treatment of knee cartilage defects. The LIPO-AMIC technique has been used for the treatment of ICRS degree III and IV focal cartilage defects in the knee. Eighteen patients have been prospectively evaluated during two years both clinically and by MRI evaluation. Patient showed progressive significant clinical improvement of all the scores (IKDC, Lysholm, Koos and VAS) as early as the initial 6 months follow-up after the LIPO-AMIC procedure and further increased values were noted till the last follow-up at 24 months postoperatively. MRI examination showed early subchondral lamina regrowth and progressive maturation of the repair tissue and filling of the defects. Overall, the possibility of obtaining a large number of viable mesenchymal cells from adipose tissue, with intact clusters and vascular stromal niches, with high chondrogenic and paracrine capacity together with the use of a collagen membrane capable of retaining the cells in situ and promoting their chondrogenic transformation, give reason of significant improvements found in treated patients and allow us to validate this technique as simple, safe and effective one-step procedure for the repair of articular cartilage defects.

Key words: *LIPO-AMIC technique, mesenchymal adipose tissue cells, chondral and osteochondral defects, regenerative medicine*

Indirizzo per la corrispondenza:
Fabio Valerio Sciarretta
Clinica Nostra Signora della Mercede
via Tagliamento, 25
00198 Roma
E-mail: fvsciarretta@me.com

OUR EXPERIENCE

International Orthopaedics
https://doi.org/10.1007/s00264-023-05921-8

ORIGINAL PAPER

One-stage cartilage repair using the autologous matrix-induced chondrogenesis combined with simultaneous use of autologous adipose tissue graft and adipose tissue mesenchymal cells technique: clinical results and magnetic resonance imaging evaluation at five-year follow-up

Fabio Valerio Sciarretta[1,2,3] · Claudio Ascani[4] · Luca Sodano[5] · Carolina Fossati[2,3] · Silvana Campisi[2,3]

Received: 13 April 2023 / Accepted: 30 July 2023

Abstract

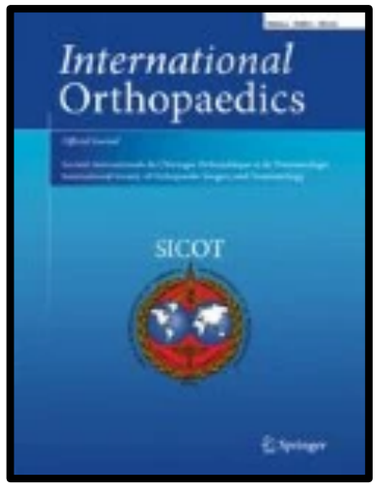
Purpose To evaluate medium-term outcomes of knee cartilage defects repair by autologous matrix-induced chondrogenesis combined with simultaneous use of autologous adipose tissue graft and adipose tissue mesenchymal cells, defined as LIPO-AMIC technique.

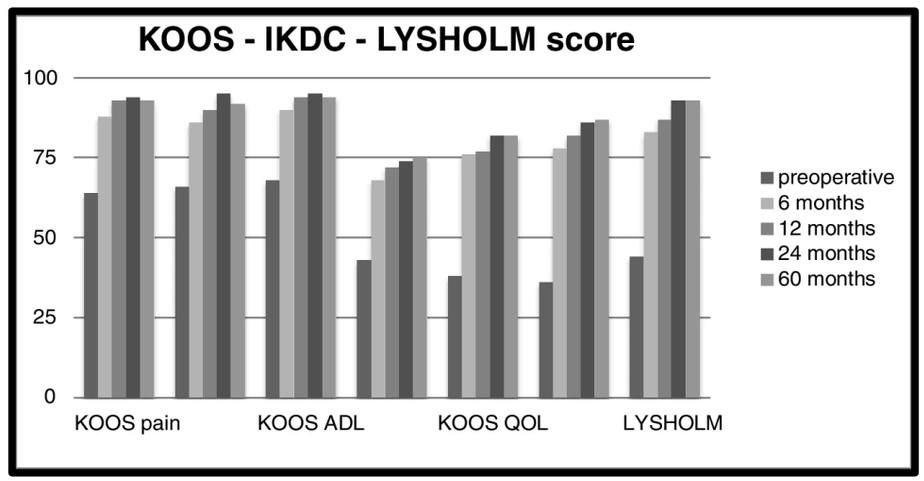
Methods The LIPO-AMIC technique has been used in ICRS degree III–IV knee defects. Eighteen patients have been prospectively evaluated during two and five years both clinically and by MRI.

Results Patients showed progressive significant improvement of all scores starting early at six months, and further increased values were noted till the last follow-up at 60 months. Mean subjective pre-operative IKDC score of 36.1 significantly increased to 86.4 at 24 months and to 87.2 at 60 months. Mean pre-operative Lysholm score of 44.4 reached 93.5 at two years and 93.5 at five years. MRI examination showed early subchondral lamina regrowth and progressive maturation of repair tissue and filling of defects. The mean total MOCART score showed that a significative improvement from two year follow-up (69.1 points) to last follow-up was 81.9 points (range, 30–100 points, SD 24). Complete filling of the defect at the level of the surrounding cartilage was found in 77.8%.

Conclusions Adipose tissue can represent ideal source of MSCs since easiness of withdrawal and definite chondrogenic capacity. This study clearly demonstrated the LIPO-AMIC technique to be feasible for treatment of knee cartilage defects and to result in statistically significant progressive clinical, functional and pain improvement in all treated patients better than what reported for the AMIC standard technique, starting very early from the 6-month follow-up and maintaining the good clinical results more durably with stable results at mid-term follow-up.

Keywords LIPO-AMIC · Cartilage defects · Cartilage repair · Adipose tissue graft · Adipose tissue stem cells · Matrix-induced chondrogenesis



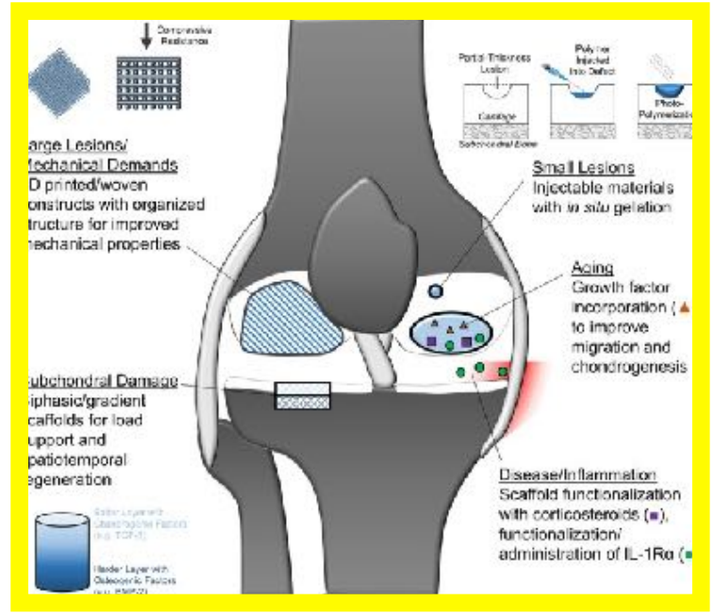


The functional outcomes evaluation permitted to notice a significant greater and earlier improvement in pain relief, starting from the six month follow-up control and remarkably better improvements than the data reported in the AMIC Registry

Take Home Messages

✓ **Current cartilage regeneration treatments (MACI, AMIC) have shown good results in ideal "green knees"**

We need to specifically evaluate these techniques in the "red knees", patients with large lesion size, high mechanical demands, older age, inflammation, infection & systemic diseases



…Translational research in cartilage tissue engineering is now working on it….

✓ **Growth factors and other drugs released from scaffold materials can be used to recruit and rejuvenate cartilage progenitor cells in elderly patients**

✓ **Scaffold material and fabrication technique can be tuned to provide greater surface area coverage and mechanical support**

✓ **Targeted delivery of NSAID's may improve scaffold integration and maturation in patients with inflammatory comorbidities**

Take Home Messages

✓ Earlier diagnosis of isolated full-thickness cartilage defects through compositional MRI protocols (T2 Mapping, d-GEMRIC) that show early changes of osteochondral unit substructure (proteoglycan & collagen content)

✓ Earlier diagnosis will favour biologic treatments of developing lesions preventing OA cascade

Cartilage repair protocols that reverse cascade towards OA & offer many years of high function to all patients especially the active and aging populations

✓ Combination Therapies must be evaluated to better replicate the anticatabolic, proanabolic and organized manner of chondrocyte proliferation and incorporation

✓ Scientists, engineers & physicians TEAM WORK to advance clinical therapies capable of achieving a meaningful increase in the functional status of patients

Cartilage Surgeon's Goal:
Push the Patient back up the Hill

Healthy
Knee

Uni or
Total Joint