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Outcomes Following Gel-Based Autologous Chondrocyte Implantation For Articular Cartilage Defects Of The Knee

Dinshaw Pardiwala, Abhay Narvekar, Ashish Babhulkar, David Rajan, Deepak Chaudhary, Jacob Varghese, Parag Sancheti, Sachin Tapasvi

MULTICENTRIC STUDY, INDIA

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Disclosures:

- None of the authors received financial support for this study.
- None of the authors have any competing interest or conflict of interest with regards the topic of this study.
- The study was conducted in accordance with the Declaration of Helsinki. The study protocol was approved by a common Institutional Ethics Committee.

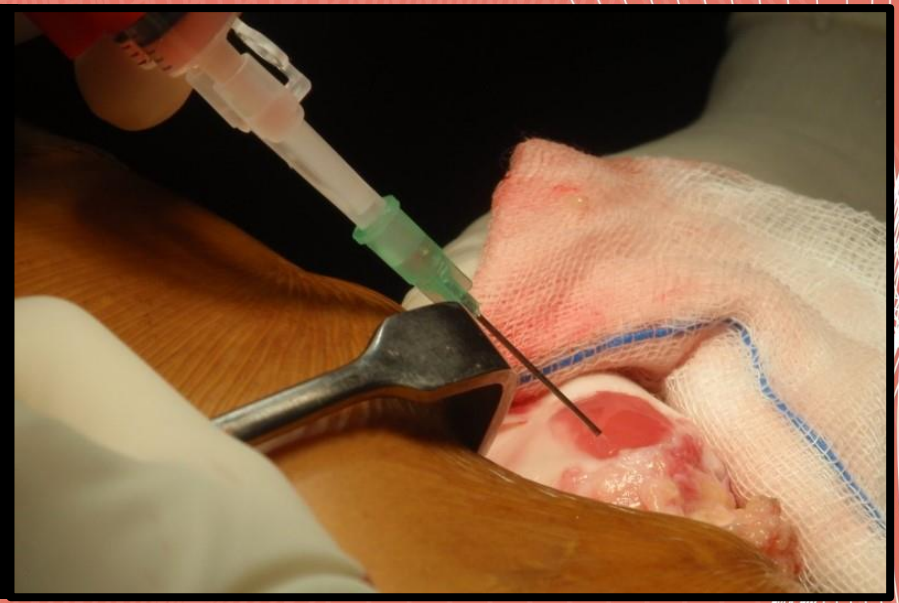
Introduction

- Autologous chondrocyte implantation (ACI) has been established as an effective treatment option for large articular cartilage defects of the knee as it results in hyaline rich cartilage repair and regeneration.
- However, conventional ACI is a complex surgical procedure with unpredictable topographic restoration of the articular surface.
- Gel-based ACI (GACI) enables a simpler and more effective delivery of chondrocytes with reproducible three dimensional structural restoration of the articular cartilage surface.

Aims

- **Although GACI has been available for clinical use for almost two decades now, there is limited documentation of medium-term outcomes.**
- **In this study, we retrospectively evaluated the 7 to 14 years outcomes in patients treated with GACI (CARTIGROW®) for large focal articular cartilage defects of the knee.**

GACI involves a technique in which cultured chondrocytes are mixed with fibrin glue ex vivo and implanted as an injectable form that solidifies within 4 minutes of cell delivery. This latest generation of ACI facilitates an even cell distribution within the defect, enables a three dimensional structural restoration of the articular cartilage surface topography, ensures a stable cartilage repair construct well-attached to the subchondral bone, and a potentially decreased risk of graft hypertrophy. Moreover, this delivery system has simplified the surgical technique substantially and improved the ability of the surgeon to address defects of varied shape and depth.



Methods

- Multicentric retrospective study.
- Patients having undergone gel-based ACI (CARTIGROW®) for the treatment of focal articular cartilage defects of the knee between 2008 to 2014 and having a minimum 7 year follow-up after surgery.
- Inclusion criteria
  - Patients aged 18 to 60 years
  - Patients with isolated focal articular cartilage defects of the knee of ICRS grade III/IV severity, or unstable osteochondritis dissecans, and normal coronal limb alignment.

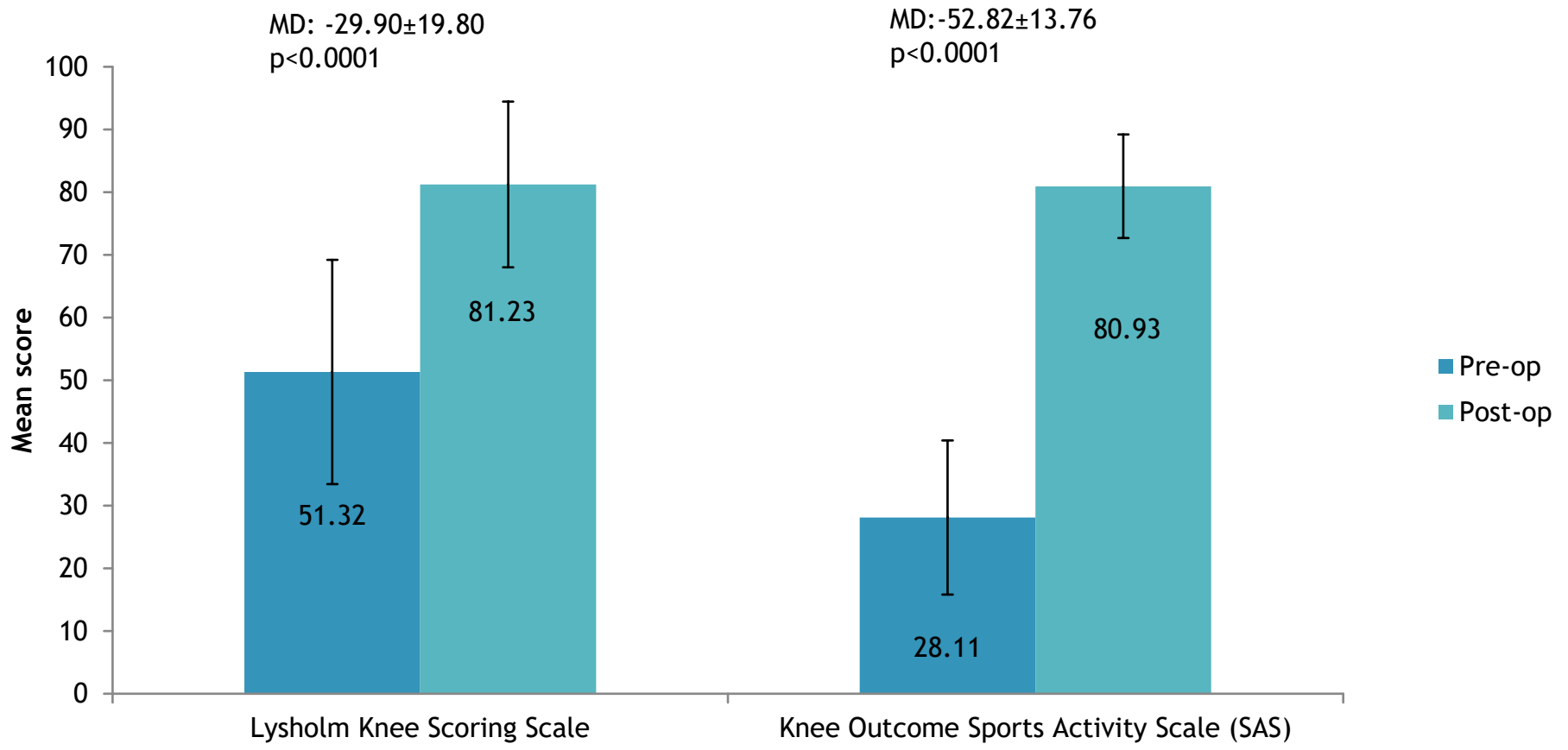
Methods

- **Primary outcome – assessment with Lysholm Knee Scoring Scale, and Knee Outcome Sports Activity Scale (SAS).**
- **Secondary outcome – MRI assessment of cartilage repair using MOCART.**
- **The study also assessed complications following GACI, time to resume sports following GACI, and need for revision surgery following GACI.**

Results

- A total of 107 patients (110 knee joints) were included.
- Mean age : 31.0±10.5 years with 68.2% males.
- Mean follow-up following GACI was 9.8±1.5 years (range 7.85-13.43).
- 39 of the articular cartilage defects (35.4%) were ICRS grade III, 20 (18.2) were ICRS grade IV, whereas 51 (46.4%) were osteochondritis dissecans (ICRS OCD II to IV).
- Mean defect size was 4.5±5.8 cm^2.
- MOCART scores ranged from 45 to 100 with a mean of 84.5±4.3.

Results : Functional Scoring



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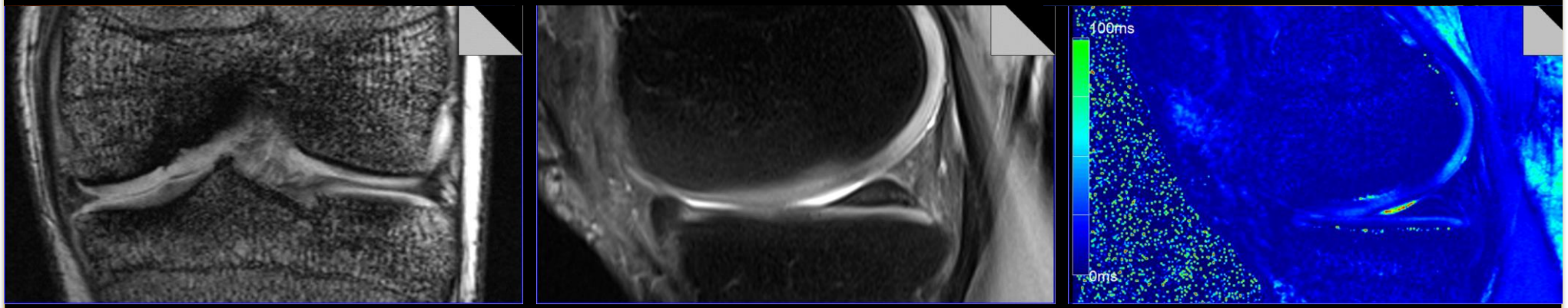
Results

- Among 30 patients who were playing sports before treatment, 56.7% (n=17) could return to the same or higher level of sports following GACI.
- Mean duration to resume sports was 8.32±1.82 months.
- No major intra-operative or post-operative complications were noted.
- 4 patients warranted revision surgery and included 1 arthroscopic debridement, 2 mosaicplasty, and 1 TKR.

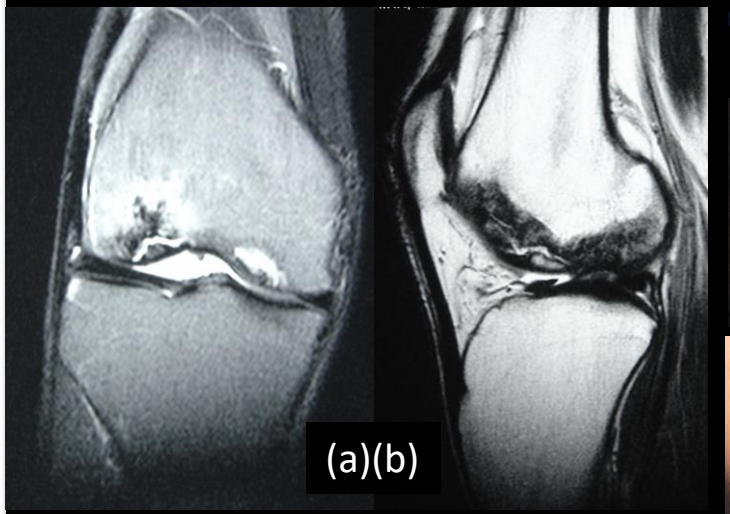
GACI For Left Knee Medial Femoral Condyle Osteochondritis Dissecans

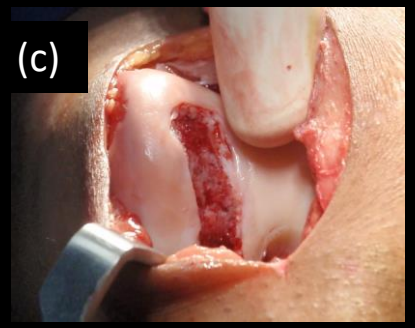
Intraoperative images : exposure of MFC OCD defect, recipient site preparation, and gel ACI implantation.

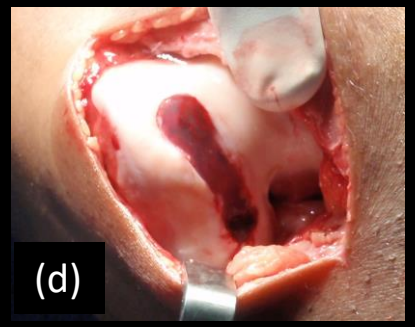


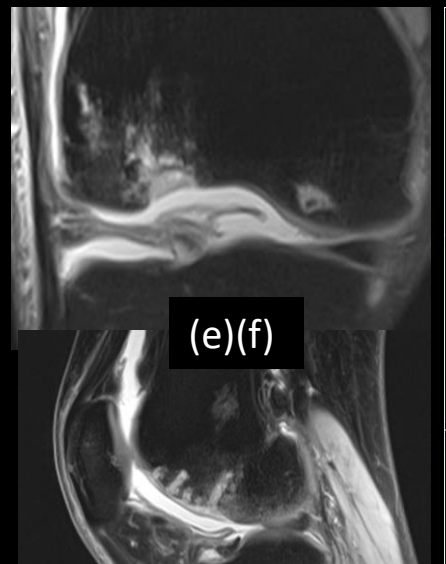
2 yrs postop MRI reveals complete defect filling with homogenous repair, an intact smooth surface, and complete interface integration (MOCART score = 95). T2 STAR cartilage mapping 2 years following surgery reveals T2 values of repaired cartilage similar to that of the adjoining normal cartilage, indicating a successful hyaline cartilage repair.

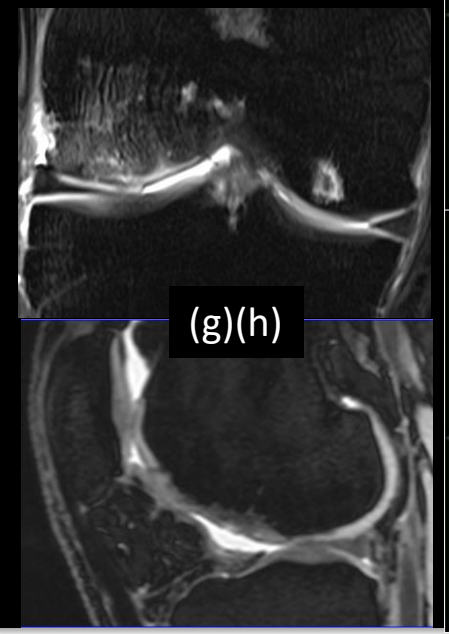
GACI For Right Knee Lateral Femoral Condyle ICRS Grade IV Chondral Defect

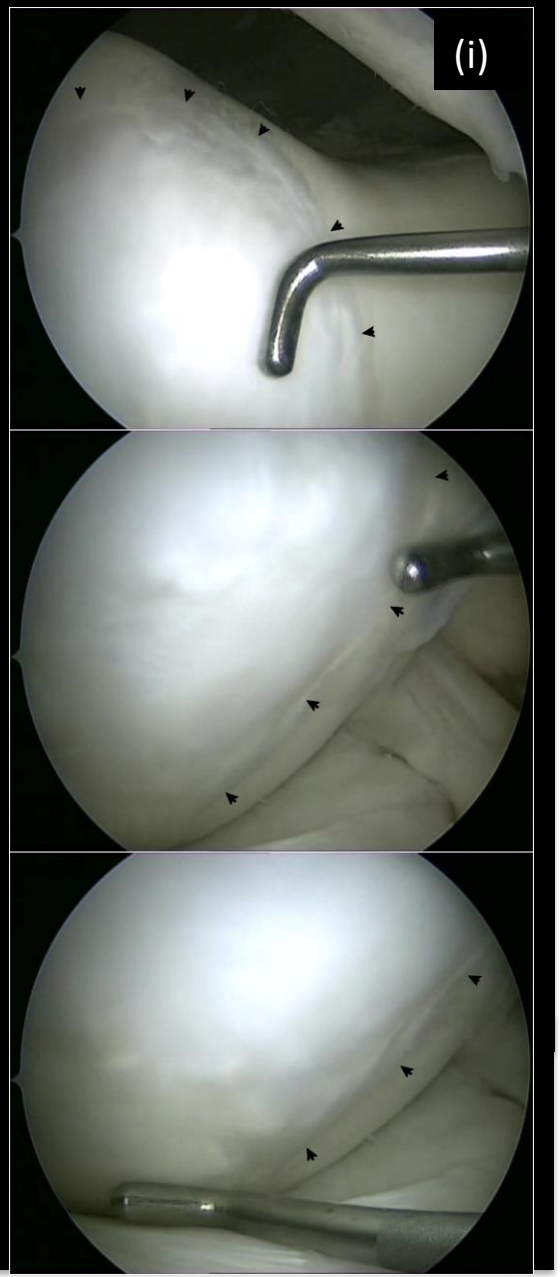












(a)(b) MRI : unstable osteochondral lesion of LFC secondary to AVN. (c) Recipient site preparation. (d) GACI implantation. (e)(f) Postop MRI 6 months following ACI reveals a stable cartilage repair. (g)(h) Postop MRI 24 months following ACI reveals complete defect filling with homogenous repair and an intact smooth surface. (i) Relook arthroscopy one year following ACI reveals an ICRS grade II (nearly normal) cartilage repair with repair in level with surrounding cartilage, with a demarcating border <1 mm., and intact surface.

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Conclusions

- **Gel-based ACI is an effective treatment option with a low complication rate and revision rate for repair of large focal articular cartilage defects of the knee, and results in significant improvement in functional scores when evaluated 7 to 14 years following the procedure.**

- **The functional outcomes of gel-based ACI is comparable to conventional ACI, with the added benefit of ease of delivery and decreased graft hypertrophy.**

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