

Introduction

Articular cartilage is the highly specialized tissue of synovial joints that provides a smooth and lubricated surface to allow for low friction distribution of forces. [1] Unfortunately articular cartilage has limited capacity for innate healing when it is injured due to lack of blood vessels, nerves, or lymphatics. Reconstruction of articular cartilage has always been a particular challenge due to cartilage's limited capacity for intrinsic healing and the debilitating nature of the injury. Recently, the use of cryopreserved amniotic membrane-umbilical cord (AM-UC) has been used as adjunctive therapy in various orthopedic indications due to its properties known to modulate the healing process.

Goal

The objective of the study was to determine the degree of efficacy and safety of particulate AM-UC injection when used as an adjunctive treatment for OCA.

Methods

A single-center, retrospective study was conducted on patients that underwent knee osteochondral allograft transplantation and intraoperative injections of AM-UC between January 2013 and January 2017. Study outcomes on patient's reported outcomes through use of the VAS, IKDC, Lysholm score, SF-12, and KOOS. Outcomes measures were collected pre-operatively and post-operatively at 3, 6, and 12 months following surgery; the occurrence of complications or re-operations were also assessed. Descriptive statistics were used to characterize the study endpoints and are reported as mean \pm standard deviation. Continuous outcome measures were evaluated using a standard t-test. A p value of less than 0.05 was considered statistically significant.

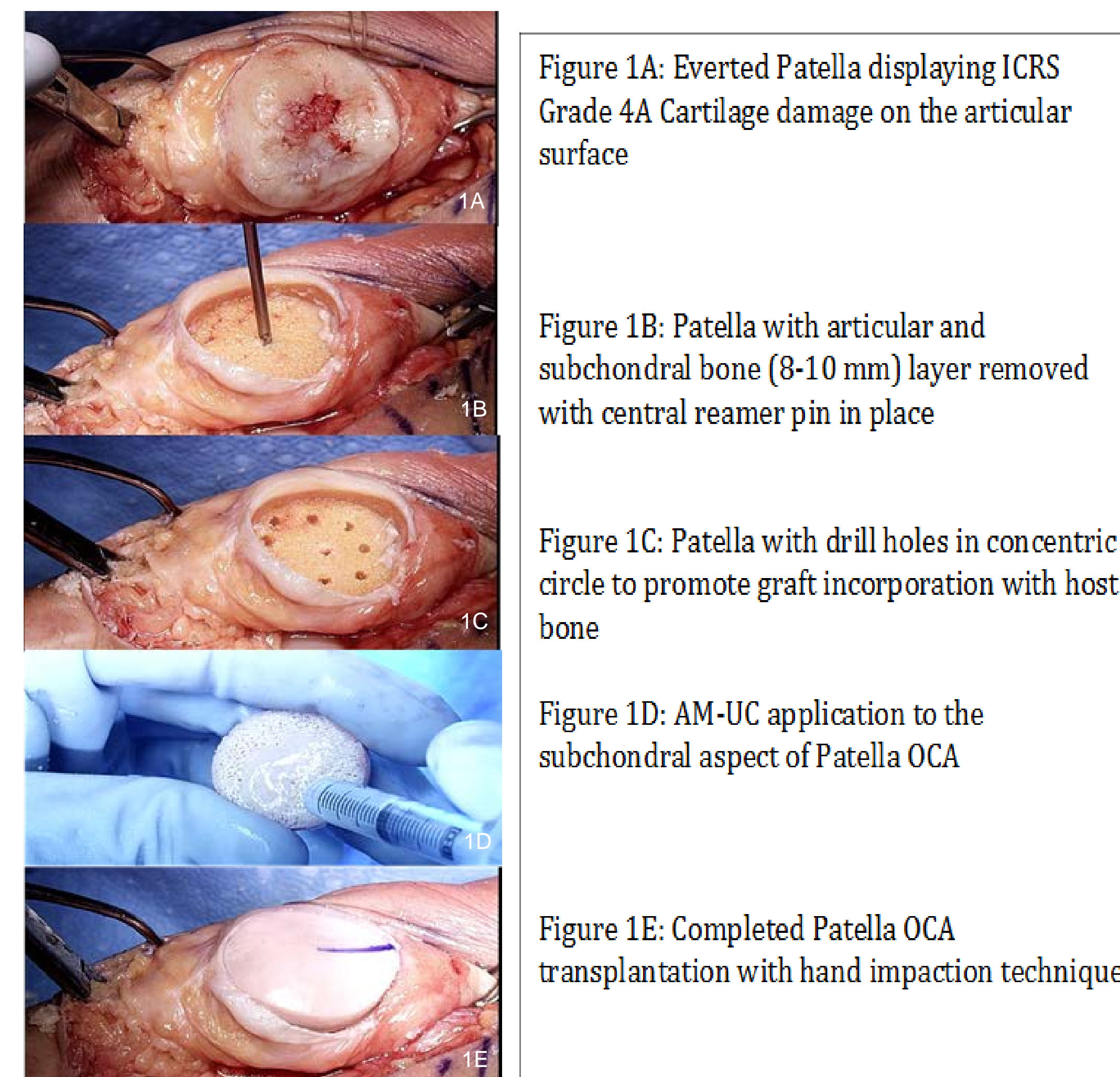


Figure 1. Representative case of articular cartilage restoration with adjunctive AM-UC.

Results

	Pain	Symptoms	ADL	Sports	QOL
Pre-op	51.5 \pm 20.3	49.3 \pm 17.9	61.9 \pm 21.6	22.1 \pm 19.5	20.2 \pm 14.3
3 Months	68.0 \pm 19.2*	66.9 \pm 17.4*	74.8 \pm 18.2*	31.0 \pm 30.3	40.9 \pm 22.8*
6 Months	69.6 \pm 20.3*	66.4 \pm 23.4*	74.9 \pm 22.1	47.9 \pm 42.6	43.7 \pm 22.9*
12 Months	86.8 \pm 11.4*	78.5 \pm 16.2*	91.5 \pm 11.2*	66.2 \pm 30.1*	39.0 \pm 19.3

Table 3. Pre-operative and Post-operative KOOS Scores. (* denotes p<0.05)

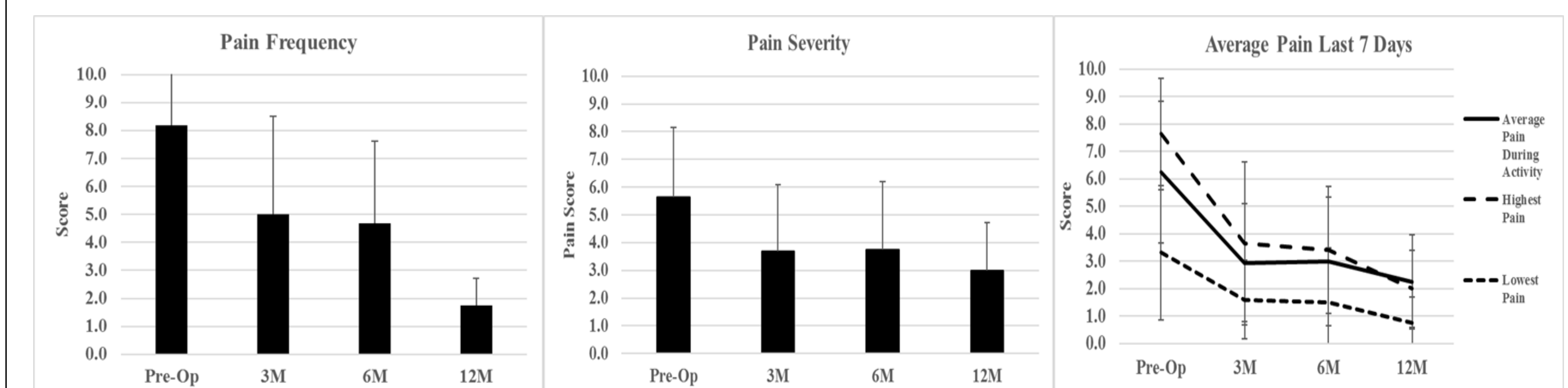


Figure 2. Patient subjective pain severity and frequency scores after cartilage restoration

Graft Placement	4°C SOC	M.O.P.S. [®]	Both
Patella	4	5	0
Femur	4	10	0
Patella/Femur	2	2	5
Tibia/Femur	0	0	1
Tibia/Femur/Patella	0	1	0

Table 1. OCA Procedure details.

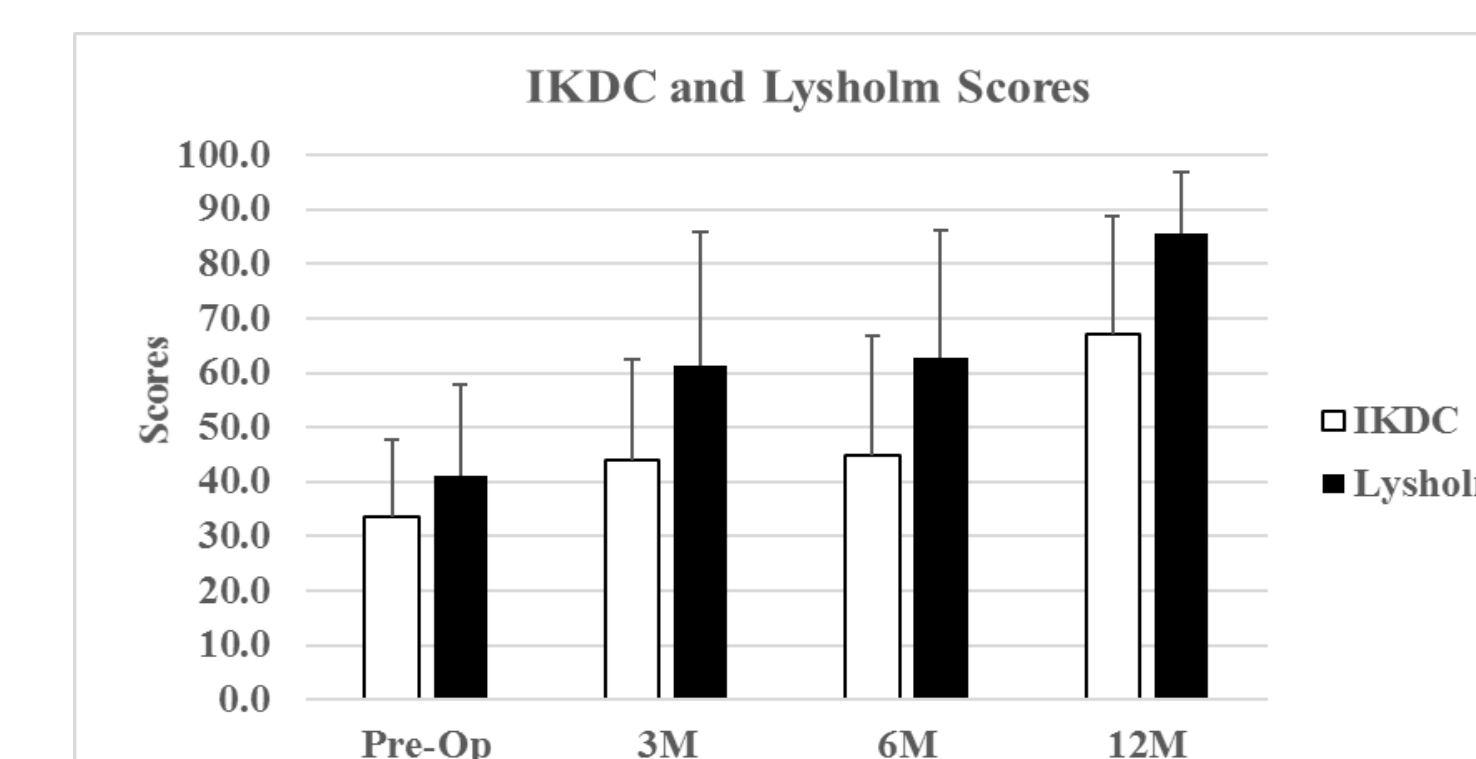


Figure 3. Pre-operative and Post-operative IKDC and Lysholm Scores

Discussion

AM-UC application to the bone layer of the OCA graft could positively impact graft incorporation and mediate post-operative inflammation potentially accelerating recovery. Previous studies have been conducted and show good results for full-thickness articular cartilage defects when treated with fresh osteochondral allografts. Average increase in IKDC score has been shown to be 20 points at 6 months, 29 points at 1 year, and 16 to 33 points out to 3.5 years post-operatively [5] [15, 16], compared to an IKDC increase of 33.7 at 1-year as shown in our study. Davidson et al showed a remarkable 52-point improvement in IKDC 3.5 years post-operatively, however the mean improvement of the Lysholm score was less than that achieved in this study (41 vs 45) [17]. These results demonstrate a beneficial effect using our technique in all regions of the knee including patellar and tibial plateau lesions; these sites of OCA transplantation have traditionally shown inferior outcomes compared to treatment of femoral condyle lesions.[18] In fact, our results showed an increase in average KOOS sub-scores of 31 which reaches a clinically relevant improvement as suggested by a recent meta-analysis.[19].[20] Our results at one year demonstrate outcome measures better than those reported in the literature. Further follow-up in our study at the intermediate 3-5 years will be important to demonstrate sustained elevated outcomes measures and graft survivorship. The use of AM-UC may be advantageous in these cases due its compositional components known to modulate inflammation and promote healing. [24] Cryopreserved placental tissues are processed to retain the key biological and structural components of the fresh umbilical cord tissue, whereas other processing methods may alter these components. [1] Retention of these tissue components, the tissue components may aid with bone incorporation allowing optimal incorporation to the recipient tissue; this should equate to decreased pain and improved function at an earlier postoperative time point accelerating recovery. Future prospective, controlled studies with longer-term follow-up are required to confirm these hypotheses.

Conclusions

Osteochondral allograft transplantation with adjunctive application of AM-UC appears to be a safe and effective option for the treatment of large chondral lesions. The positive outcomes measures demonstrated one year after transplantation encourage more detailed evaluation of this adjunct injection in cartilage treatment procedures.

References

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