

The intra-articular injection of A NEW CHITOSAN BIOMATERIAL prevents the progression of osteoarthritis in ACLT rabbit model

PURPOSE

To evaluate the effects of a single intra-articular injection of a new biomaterial composed of alginate-chitosan (AC) beads dispersed in a viscous thermogelling chitosan-based (H) hydrogel on the development of osteoarthritis rabbit model. These effects were compared to those obtained with the intra-articular injection of either chitosan-based (H) hydrogel alone or saline solution. ■

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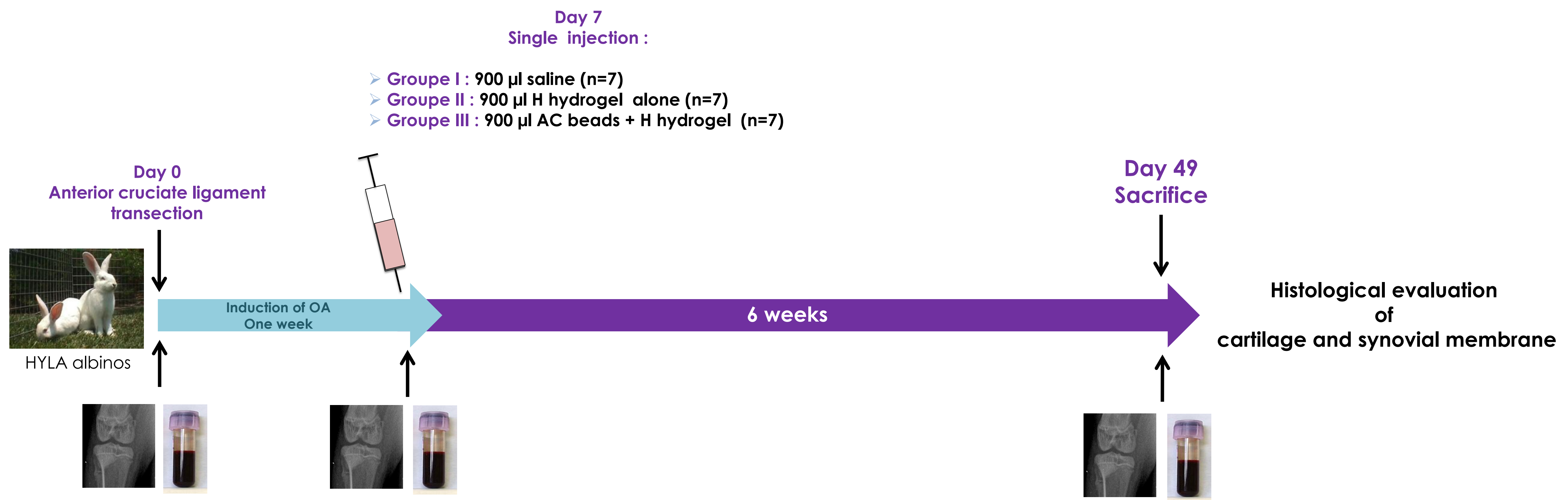
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METHODS



RESULTS

1. AC beads in H hydrogel prevented from the development of OA based on the reduction of Kellgren & Lawrence score.

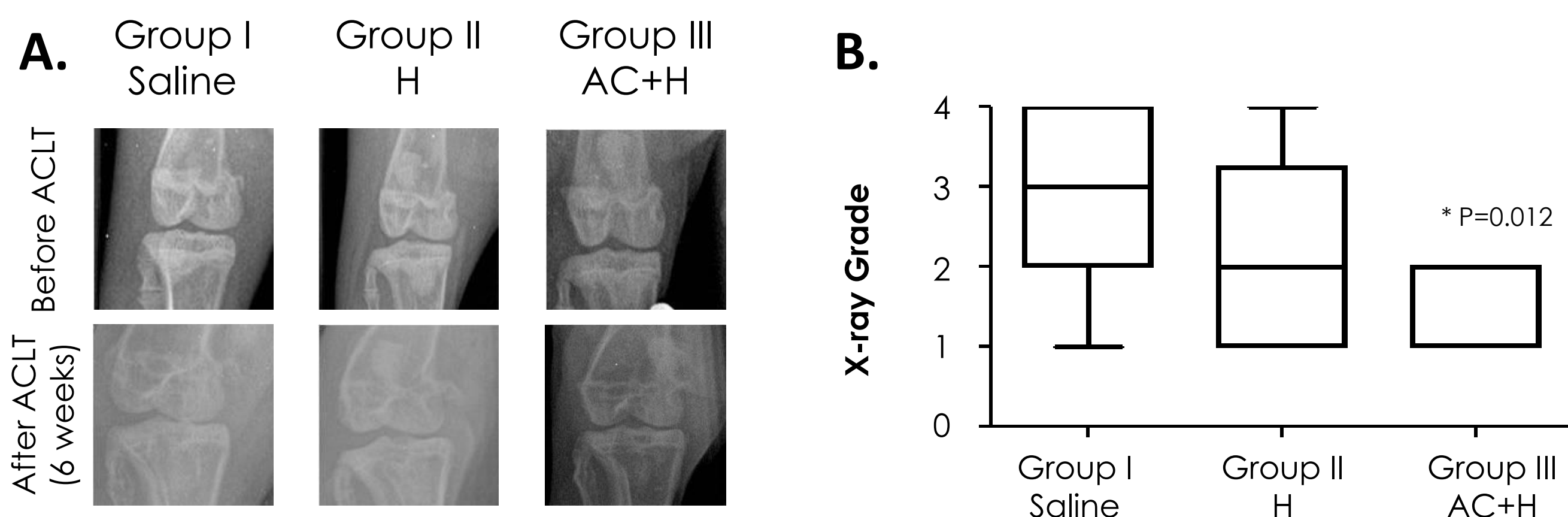


Figure 1: A. Representative X-rays from each treatment group before the ACLT surgery and before sacrifice (6 weeks after surgery) B. X-ray grading according to the Kellgren and Lawrence scale. Data are presented as a box and whisker plot. Data were analyzed with an ANOVA followed by the Bonferroni multiple comparison test. *: p vs saline.

3. No significant variation of biological markers was noted

		Before ACLT surgery	Before intra-articular injection (one week after surgery)	At the time of sacrifice (6weeks after surgery)
PGE ₂ (pg/ml/kg)	Saline	156.1±26.4	406.5±34.3	321.1±71.0
	H hydrogel	333.6±75.2	1040.0±381.5	630.9±210.2
	AC + H	185.5±84.0	461.1±169.1	367.3±116.9
CRP (mg/ml/kg)	Saline	1.68±1.02	2.08±0.55	1.66±0.79
	H hydrogel	1.57±0.63	1.96±0.60	3.31±2.04
	AC + H	0.64±0.15	4.22±0.75	4.33±1.90

Table 1: Serum levels of biological markers, PGE₂ and CRP throughout the study. Data are mean±SEM. Results were normalized by the weight of animals at the time of blood sampling. Data were analyzed with an ANOVA followed by the Bonferroni multiple comparison test. The analysis revealed no difference between group.

2. AC beads in H hydrogel significantly reduced the histological score of cartilage lesion severity. It was due to a significant effect on cartilage structure and cellularity scores.

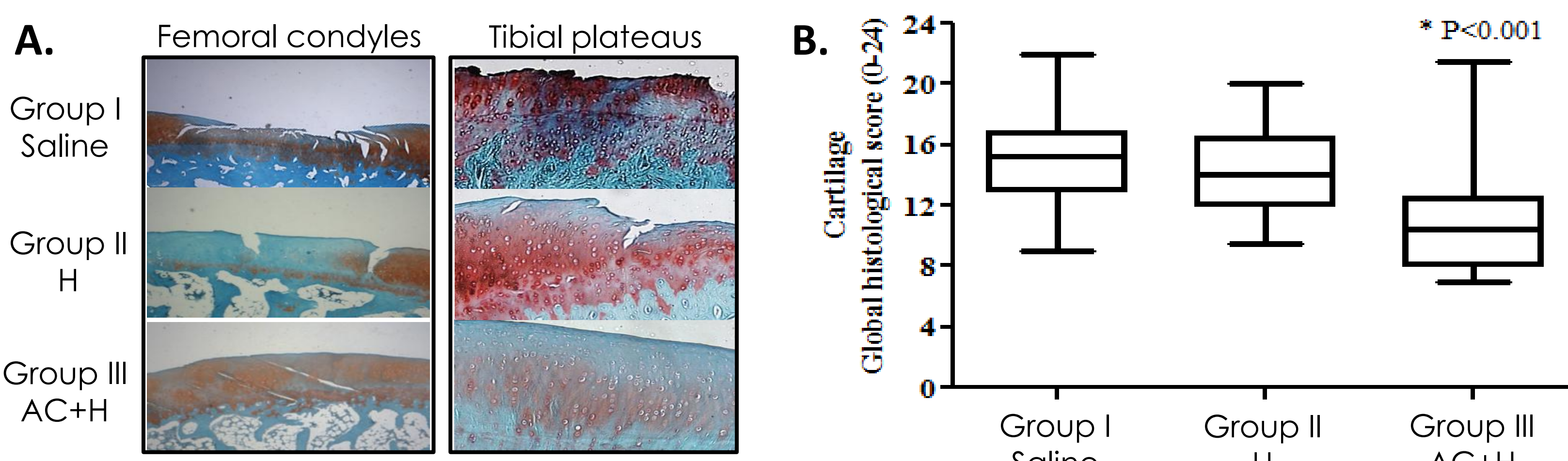


Figure 2: A. Histologic sections showing the full thickness of cartilage and subchondral bone in the weight bearing zone of the femoral condyles and tibial plateaus stained with Safranin-O/Fast green in each treatment group. B. Cartilage global score. Data are presented as a box and whisker plot and analyzed with an ANOVA followed by the Bonferroni multiple comparison test. *: P vs saline; #: P vs H hydrogel alone.

4. The injection of AC beads also tended to reduce the synovial membrane inflammation.

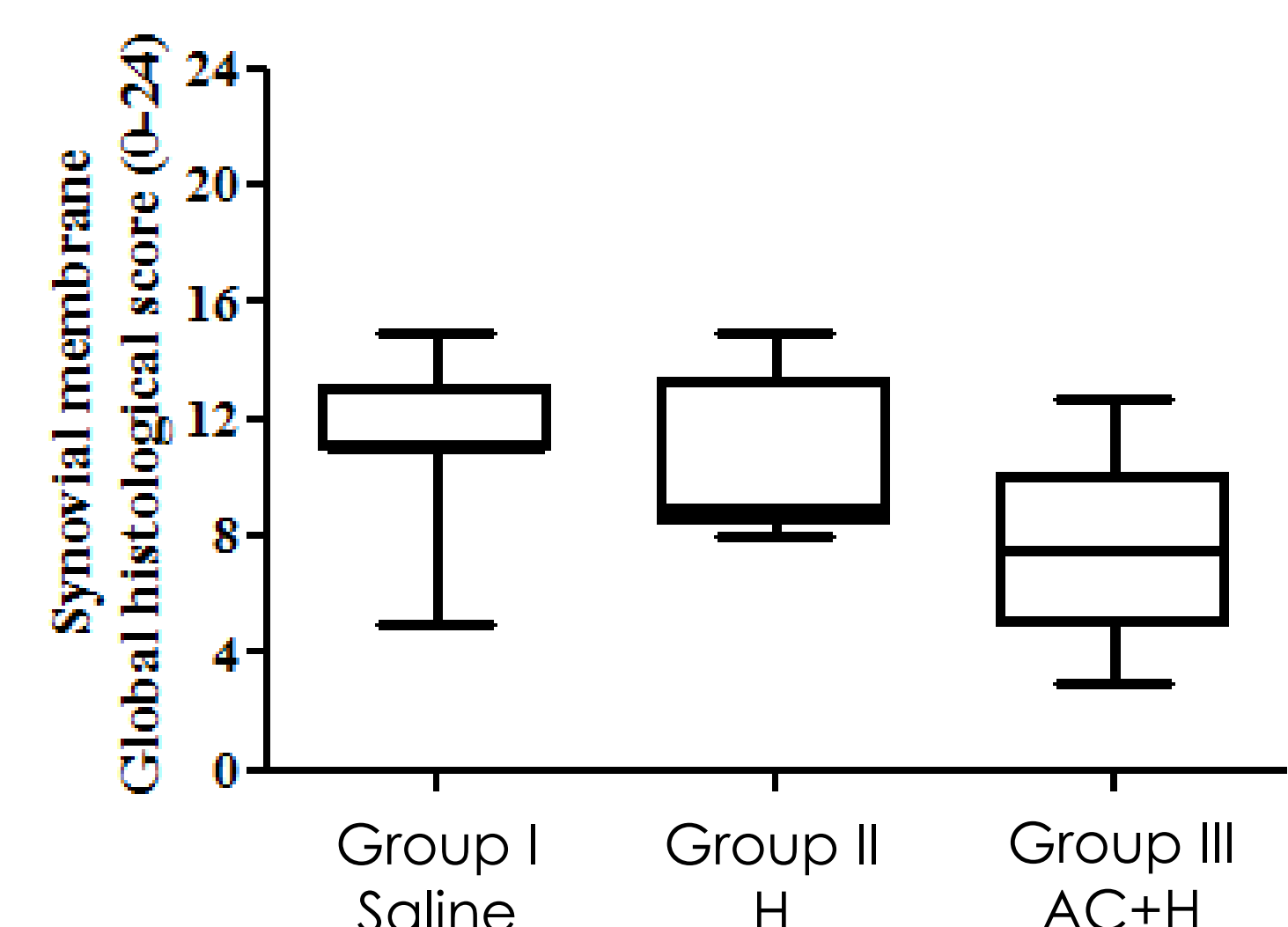


Figure 3: Synovial membrane histological score and comparison treatment groups. Data are presented as a box and whisker plot and analyzed with an ANOVA followed by the Bonferroni multiple comparison test. The analysis revealed no difference between group.

CONCLUSIONS

Alginate chitosan beads dispersed in H hydrogel prevented OA in ACL transection rabbit model. This effect was not observed with the H hydrogel alone, suggesting that alginate chitosan beads play a role in joint protection. The preventive effect was observed in all joint compartments indicating a global effect of this new implantable biomaterial.

