Hyaluronic acid/ sorbitol complex (Synolis VA) improves cartilage material properties

UNIVERSITÉ DE GENÈVE

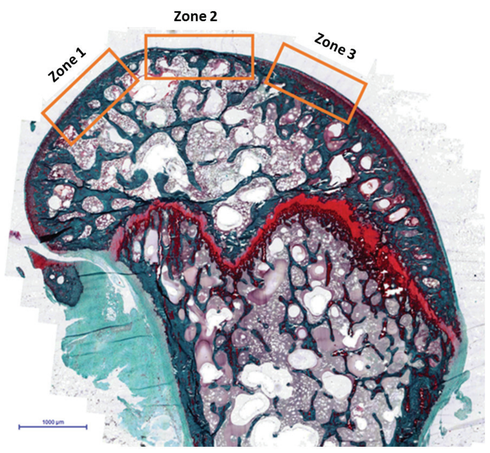
C Lavet, I Badoud, P Ammann.
Division of Bone Diseases, Department of Internal Medicine Specialties, Geneva University Hospital and Faculty of Medicine, Geneva, Switzerland

HUG Hôpitaux Universitaires Genève

Introduction

Visco-supplementation is known to influence positively pain and mobility of patient suffering from osteoarthritis. The HA/sorbitol complex (Synolis VA) has a fast and early pain relief related potentially to improvement of synovial fluid rheological properties. In this complex, sorbitol protects HA from degradation. Thus long acting effect on pain and mobility even after disappearance of the molecule from the joint cavity is poorly understood but a clinical reality. A physicochemical effect of HA/sorbitol complex (Synolis VA) on articular cartilage micromechanical properties could be one of the mechanisms implicated. Indeed the main function of cartilage (shock absorption and force transmission) is influenced by its biomechanical characteristics.

Methods



In vitro model: Distal femurs were harvested from twelve 11-month-old rats. Bio-indentations were performed before and after an overnight incubation in Synolis VA or in PBS (incubation 1). To investigate the persistence of the effect all samples were then tested after a second overnight incubation in PBS (incubation 2). Cartilage quality assessment: Bio-indentations (PIUMA OPTICS) were performed at the level of the medial condyle at two different areas submitted physiologically to different mechanical loading. Elastic modulus (MPa) and maximal force (N) were recorded. Indentation depths were located in the upper part of the hyaline cartilage. Cartilage thickness assessment: Cartilage thickness was evaluated by contrast enhanced computed tomography with ionic contrast agent using (Hexabrix®) at the site of indentation. A control experiment was performed to confirm that the two groups have the same cartilage geometry (data not shown).

Results

1. Improvement of cartilage modulus after incubation in Synolis VA

Incubation in the first bath (PBS or Synolis VA)

2. Persistence of this effect even 48 h after exposure

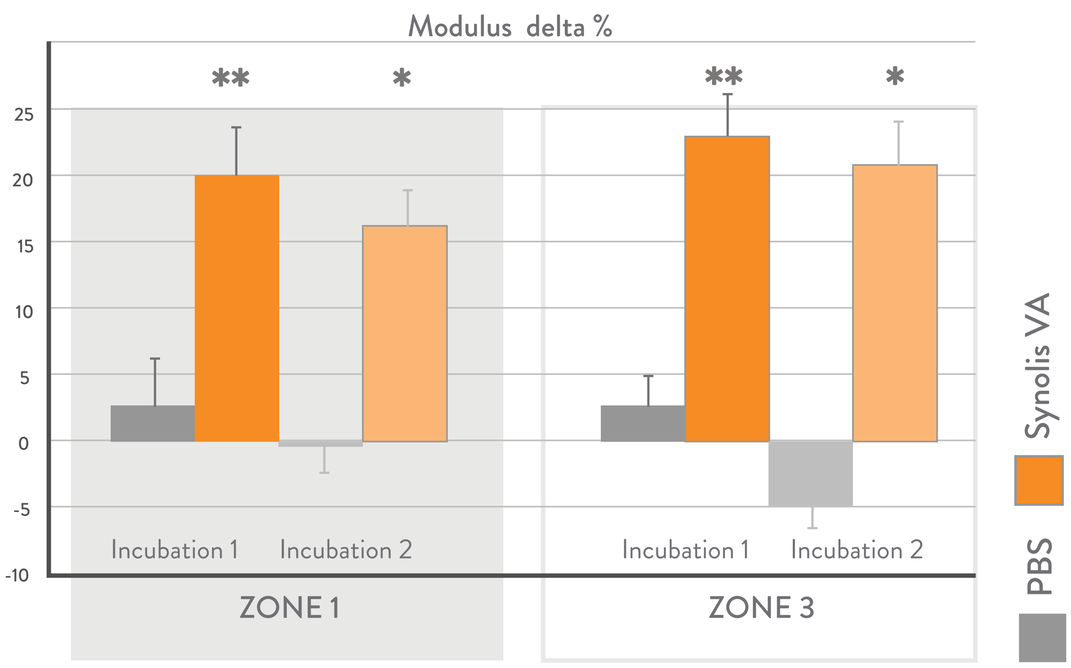
Incubation in the second bath (PBS)

ZONE 1

	PBS basal	PBS bath #1	Synolis VA basal	Synolis VA bath#1	PBS bath #2	Synolis VA bath #2
Modulus	3.99 ± 0.33	4.12 ± 0.38	4.08± 0.30	4.86± 0.29 ***	3.97±0.28	4.72±0.29***
Indentation Force	987 ±51	917 ±81	937 ±25	1005±29*	939±34	978±41
Indentation Depth	8.96 ±0.59	9.58 ±0.85	9.07 ±0.25	8.30 ±0.36**	8.74±0.32	8.73±0.52

ZONE 3

	PBS basal	PBS bath #1	Synolis VA basal	Synolis VA bath#1	PBS bath #2	Synolis VA bath #2
Modulus	1.46 ± 0.10	1.48 ± 0.09	1.47± 0.17	1.79± 0.19***	1.38±0.07	1.76±0.19**
Indentation Force	379 ±36	396 ±47	431 ±58	501±56 *	426±43	488±50
Indentation Depth	18.50 ±1.07	18.18 ±0.95	17.60 ±1.26	15.89 ±1.24	17.27±0.89	16.61±1.26



Conclusion

- This explorative study represents a proof-of-concept demonstrating a physicochemical effect of Synolis VA on cartilage material level properties.
- It also demonstrates the persistence of the effect even after disappearance of Synolis VA of the incubation bath; suggesting a penetration and fixation of HA in cartilage tissue which could also account for the rapid clearance of HA in the joint cavity after injection.
- These results indicate that physicochemical improvement of cartilage material properties by Synolis VA could represents a major mechanism explaining its long term efficacy.