Natural and mobile interactions

Long chains of HA

DYNAMIC RHEOLOGY FOR HYALURONIC ACID FILLERS

WELCOME TO THE ERA OF DYNAMIC AESTHETICS

TEOSYAL® RHA
RESILIENT BEAUTY

In a healthy skin, native HA is made of long chains (High Molecular Weight (HMW) HA > 1 000 kDa). These long chains of natural HA self-organize in a 3D mobile network:

- Extracellular matrix expansion
- Hygroscopy
- Viscoelasticity
- Tissue structure and volume
- Hydration
- Shock absorber

Thanks to these properties, hyaluronic acid maintains tissue architecture, volume and hydration.

Increasing HA stability and concentration into the dermis, and preserving its optimal length may contribute to enhance the skin quality, its regeneration capacity and hydration to counteract ageing process.

Thanks to these properties, hyaluronic acid maintains tissue architecture, volume and hydration.

Short chains of HA

Exacerbating inflammatory process

Deleterious impact on skin health and ageing

Loss of viscoelastic properties

Loss of space filler and shock absorber role

Structural role of the long chains of HA

Opposite functions of the short chains of HA

With age, the quality of HA in the dermis changes: especially the HA polymers are shortened leading to a higher proportion of short chains (Low Molecular Weight (LMW) HA < 500 kDa). Long chains (LMW) of hyaluronic acid during its crosslinking process may have deleterious effects and limit usefulness of the product.

Increasing HA stability and concentration into the dermis, and preserving its optimal length may contribute to enhance the skin quality, its regeneration capacity and hydration to counteract ageing process.

What do your patients need?

Concerns of the patients before hyaluronic acid injection:

- Trust in doctor
- Natural results
- Minimal pain
- Easy injectable
- Painless

TOWARDS RESILIENCE


From native HA to dermal filler

Classical crosslinking method

Optimization of the crosslinking parameters

Temperature + Pressure + pH + Initial HA concentration & molecular weight + Mixing conditions + Duration

Better preserved natural and mobile interactions

Better preserved length of the HA chains

Less modified HA - lower BDDE rate (3.0 - 10.0%) (1, 12)

Strength: resistance to compression

Stress applied by the injector

Stretch

Linear viscoelastic region

Non-linear viscoelastic region

Ultra thin needle

Facial dynamism

THE DYNAMIC RHEOLOGY CONCEPT

The thermal stability curve of crosslinked hyaluronic acid (HA) gels shows two regions of viscoelastic properties. The gel becomes viscoelastic (structure resistance) when submitted to a determined stress.

By associating the Strength and Stretch concepts, dynamic rheology brings a holistic and comprehensive response to the gel behaviour.

The gel is submitted to a determined stress, like movements of the facial tissues.

Obtained by integrating the G' curve, the dynamic G' or Strength characterizes the robustness of the gel to repeated small stress, like micromovements of the facial tissues.

50 100 150 200

stiffening of the HA network structure depending on the stress intensity.

Strength (mPa)

G' dynamique = Strength

The conventional rheology measures do not provide information about the gel behaviour under such large deformations.

To complete this dynamic approach and considering that the real deformations a filler is submitted to are actually beyond the linear viscoelastic region, the next step was to assess the gel behaviour in the non-linear viscoelastic region.

Generally, the polymer parameters characterizing a viscoelastic fluid such as a gel are mainly measured under low stress and small oscillations. Such conditions do not actually reflect the mechanical stress a filler is put to by its function.

TEOXANE Laboratories decided to go beyond and develop new parameters facilitating the characterization and discrimination of various gels depending on their clinical objectives: the Strength & the Stretch.

For each rheological parameter, the TEOXANE Laboratories innovation ‘Preserved Network’ method allows obtaining less-structured gels and more natural results and effects.

The TEOXANE Laboratories innovation

‘Preserved Network’ method

Better preserved length of the HA chains

Long chains > short chains

BDDE 1.9 - 4.0% (10)

Less modified HA : lower BDDE rate (1.9 - 4.0%) (16)

Long chains > short chains

BDDE 5.0 - 10.0% (5)

Better preserved natural and mobile interactions

Short chains > long chains

BDDE 5.0 - 10.0% (5)

Maintains natural viscoelastic properties: Dynamic structure

Over 1000000

Time (s)

50000

10000

500

100

5

Temperature

Pressure

pH

Initial HA concentration & molecular weight

Mixing conditions

Duration

Classical crosslinking method

‘Preserved Network’ method

Preserved Network

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Less modified HA - lower BDDE rate (3.0 - 10.0%) (1, 12)

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