FACIAL AESTHETICS · INJECTABLE DERMATOLOGY · CASE STUDY

Spring Theory

A Case Study of Hyaluronic Acid Fillers Based on Hooke's Law for Improving Dynamic Smile Lines

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Objective

To propose a novel **hyaluronic acid (HA) filler injection technique** for dynamic smile lines based on Hooke's Law, aiming to achieve a more natural and youthful facial expression.

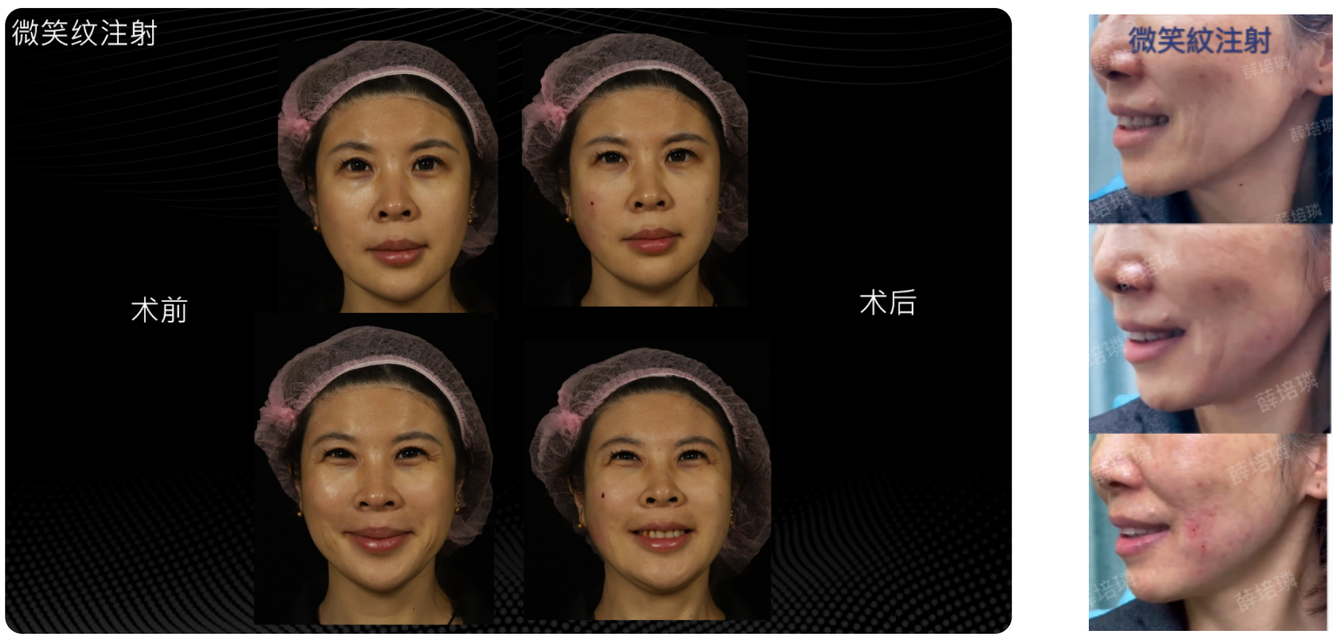
Methods

Two middle-aged patients (40–45 years) with prominent dynamic smile lines were treated with **Restylane Defyne**. Using a 25G cannula, small aliquots of HA filler were injected into the superficial fat layer in a **retrograde vertical linear pattern** perpendicular to the smile lines — designed so that linearly distributed filler provides supportive resistance against repetitive muscular movement. Outcomes were assessed via before/after dynamic smile photography and patient-reported satisfaction.

TECHNIQUE PARAMETERS

- Restylane Defyne
- 25G Cannula
- Superficial Fat Layer
- Retrograde Vertical Linear Pattern

Results



Representative case — static & dynamic smile, before / after treatment

- ✓ Immediate improvement in dynamic smile lines
- ✓ Softer, more youthful expression
- ✓ No nodules or filler displacement
- ✓ High patient satisfaction, both cases

Discussion — The Spring Theory

HOOKE'S LAW, APPLIED TO FILLER PLACEMENT

$$F = k \cdot x$$

F — restoring force opposing skin deformation

k — stiffness of the linear filler configuration

x — displacement from repetitive muscle contraction

Conclusion

This case study suggests that HA filler injection based on a Hooke's Law-inspired biomechanical concept may be an **effective and safe approach** for improving dynamic smile lines. Further studies with larger sample sizes and objective dynamic assessment are needed to validate this technique.