Application of E-D-D-L Four-Dimensional Positioning Precise Injection Technique in Facial Rejuvenation

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Abstract

**Objective:** To evaluate the clinical efficacy of E-D-D-L four-dimensional precision injection technique in facial rejuvenation. **Methods:** Eighty-four patients with aging face were selected as study subjects in our hospital from November 2020 to November 2021. All patients were treated with E-D-D-L four-dimensional precision injection for facial rejuvenation. VISIA skin detector was used for skin monitoring before, during and after treatment. Clinical efficacy was evaluated by clinicians and treatment satisfaction was evaluated by patients.

**Results:** After treatment, texture, wrinkles and brown spots detected by VISIA were significantly improved compared with those before treatment, with statistical significance (P<0.05). The total effective rate of facial contour and skin texture improvement evaluated by clinician was 98.8% and 91.67%. Patients reported the self-satisfaction of facial contour, skin quality and postoperative complications was 98.8%, 95.2% and 90.5%, respectively. **Conclusion:** E-D-D-L four-dimensional positioning precision injection has significant aesthetic effect in facial rejuvenation without obvious side effects, which is worthy of clinical promotion.

**Keywords**
Clinical Efficacy, E-D-D-L Injection Technique, facial rejuvenation

A number of factors can cause aging face. Bones and soft tissues will undergo physiological and morphological changes, including bones, ligaments, muscles, fascia, fat and skin [1]. Facial rejuvenation refers to various means and methods that can make aging face rejuvenating. There are many treatments for facial rejuvenation, but clinical reports have different effects [2-7]. This study focuses on four aspects of aging of facial tissues, on the basis of which E-D-D-L four-dimensional positioning precision injection is summarized and the application effect of E-D-D-L four-dimensional positioning precision injection in facial rejuvenation is evaluated, in order to provide reference for clinical application.

1. Data and methods

1.1 Clinical Data:

A total of 84 patients with natural aging of facial skin, including 22 males and 62 females, were selected as the research objects, and transient aging diseases caused by external factors were excluded clinically. The age ranged from 31 to 53 years, with an average age of (46.30±6.20) years. All patients were photographed before and after surgery, followed up regularly, and the efficacy was evaluated. Inclusion criteria: (1) All patients had facial soft
tissue sagging and/or facial soft tissue atrophy and collapse, etc. (2) Complete clinical data; (3) Able to cooperate with the operation; (4) The study was approved by the medical ethics Committee of the hospital, and all patients signed informed consent. Exclusion criteria: (1) mental disorders and consciousness disorders; (2) can not cooperate with the operation; (3) allergic constitution; (4) pregnant women and lactating women.

1.2 Surgical methods

1.2.1 Preoperative preparation:
According to the different facial contours of patients, the sites to be treated and the doses of drugs to be injected were marked, and the front, side and elevation of patients were observed at the same time during design. Rivet lifting injection technique and Retrograde Sector injection Technique require cross-linked sodium hyaluronate gel for medical injection. The material required for dermal microinjection and needle rolling therapy is bio-recombinant type III humanized collagen.

1.2.2 Rivet lifting injection technique
The sagging part of the face corresponds to four true ligaments includes the orbital ligament, the zygomatic ligament, the maxillary ligament and the mandibular ligament. “Rivet lifting injection technique” means to inject hyaluronic acid with 27G sharp tip injection needle into the position of the ligament. Then Hyaluronic acid was accurately and quantitatively injected into the position of the ligamentum support with a 27G sharp tip injection needle.

1.2.3 Retrograde sector injection technique:
The sagging part of the face also corresponds to the depression and collapse of four fat pad areas: 1. superficial temporal and middle temporal space; 2. zygomatic space; 3. masseter muscle space; 4. piriform fossa space and mandibular space. Through “Retrograde sector injection technique”, hyaluronic acid was injected with 25G blunt head into deep fat pad for filling and nourishing. Retrograde sector injection technique was Face into the needle point should be located in the edge of about 1 cm from the treated relatively hidden place, into the needle point using the add a little of 2% lidocaine and 0.1% epinephrine solution of local infiltration anesthesia, local anesthesia with 25 G of blunt needle, insert to the far end of facial treatment area, needle back and began to uniform injection material sector, operations must be soft. 1mL material can be injected into 20 ~ 50 tunnels, among which 1mL material can be injected into 30 ~ 50 tunnels in orbital periorbital and orbital region, 1mL material can be injected into 10 ~ 30 tunnels in cheek, and 1mL material can be injected into 20 ~ 30 tunnels in the rest of the face. After the operation, press into the needle point and gently massage the subcutaneous tissue. Apply proper amount of auromycin ointment to the eye of the needle without bandage. Note: the above operations must be performed on the basis of adequate cleansing and disinfection. The specific dosage of drugs should be determined according to actual needs, and the total dose should not exceed 10ml.

1.2.4 Dermal microinjection and epidermal needle rolling therapy:
Before surgery, epidermal anesthesia ointment was applied to the face, and the facial anesthesia was removed 30 to 40 minutes later. The patient was placed in supine position, and the face was disinfected before treatment. Liquid collagen was injected into the dermis of deep facial wrinkles by 30G sharp head injection needle. The length of needle rolling is 0.5mm, and the horizontal - vertical - and diagonal cross rolling is carried out in the order of bilateral buccal - bilateral temple - mandibular margin - forehead - nasal alar - nasal head. Each part is carried out 10 times, and the operation is gentle. The specific dose of collagen medicine is determined by the size of the area, and the total dose should not exceed 16mg. After the operation, the facial skin was treated with a sterile moisturizing mask for 15-20 minutes.

1.3 Observation indicators and aesthetic efficacy evaluation:
VISIA skin detector was used to collect photos before and 3 months after each operation. The face was cleaned before data collection, and the measurement environment was kept relatively constant. The same physician was used to collect the photos. VISIA detection indicators mainly include spots, purplish, pores, texture, ultraviolet spots, red distribution, brown spots, wrinkles and other 8 indicators. After automatic analysis, the absolute score of each indicator is obtained. The absolute score represents the area and intensity of skin feature detection value, which is used to observe skin properties. The larger the value is, the stronger the skin feature is. After the collection, the skin characteristics were analyzed.

The doctor evaluated the cosmetic effect by the Total Effective Rate. Total effective rate = (Remarkable effect
Effective) number of cases/total number of cases ×100%
(1) Remarkable effect: the facial shape and beauty reached the expectation;
(2) Effective: the facial shape and appearance are good, but there is a certain gap with the expectation;
(3) Invalid: the facial shape and beauty did not meet expectations;

Patient satisfaction evaluation: a satisfaction questionnaire was developed to investigate the postoperative facial contour, facial skin improvement effect and postoperative complications of patients.
(1) Excellent: natural contour, full filling, improved skin quality, rosy complexion and no complications; (2) Good: the contour is natural, the filling is full, the skin quality is improved, mild complications occur, and short-term recovery can be achieved; (3) Dissatisfaction: contour was not improved, skin quality was worse than before surgery, and unacceptable complications occurred, requiring a long time to recover. Satisfaction = (Excellent + Good:) number of cases/Total number of cases ×100%.

1.4 Statistical analysis

SPSS 23.0 was used for statistical analysis of the data. The measurement data was represented by \(( \bar{x} \pm s )\), t-test was performed, and the counting data was represented by (%). P < 0.05 indicated that the difference was statistically significant.

2. Treatment results

2.1 Facial VISIA test results:

According to the analysis results of various skin features by VISIA skin detector, 3 months after comprehensive E-D-D-L treatment, facial pores, spots, purpura, ultraviolet spots and red areas were slightly improved, but the effect was not obvious, and there was no statistical significance between groups (P > 0.05). Texture, wrinkles and brown spots were significantly improved and the absolute score was significantly reduced compared with that before and after treatment, with statistical significance (P < 0.05) (see Table 1).

<table>
<thead>
<tr>
<th>Before</th>
<th>3 months after treatment</th>
<th>t</th>
<th>P</th>
</tr>
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<tbody>
<tr>
<td>Brown spots</td>
<td>62.91±15.92</td>
<td>60.46±13.88</td>
<td>2.441</td>
</tr>
<tr>
<td>Wrinkles</td>
<td>49.34±9.65</td>
<td>43.09±7.98</td>
<td>4.113</td>
</tr>
<tr>
<td>Texture</td>
<td>59.44±15.33</td>
<td>64.55±8.77</td>
<td>7.231</td>
</tr>
<tr>
<td>Ultraviolet spots</td>
<td>51.34±3.06</td>
<td>55.04±12.16</td>
<td>-1.146</td>
</tr>
<tr>
<td>Spots</td>
<td>42.12±13.22</td>
<td>33.58±18.52</td>
<td>1.603</td>
</tr>
<tr>
<td>Red areas</td>
<td>69.01±16.39</td>
<td>63.09±19.75</td>
<td>0.477</td>
</tr>
<tr>
<td>Facial pores</td>
<td>59.66±10.89</td>
<td>53.23±8.43</td>
<td>1.7</td>
</tr>
<tr>
<td>Purpura</td>
<td>47.01±11.33</td>
<td>39.59±7.76</td>
<td>-1.675</td>
</tr>
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2.2 Doctor’s evaluation and postoperative self-satisfaction survey of patients:

Doctors compared the pictures of patients before and 3 months after treatment. All patients showed different degrees of absorption of injection materials, but the postoperative effect was still relatively satisfactory. The total effective rate of facial contour and skin texture improvement was 98.8% and 91.67%, respectively. The self-satisfaction of facial contour, skin quality and postoperative complications were 97.6%, 95.2% and 90.5%, respectively (see Tables 2, 3).

<table>
<thead>
<tr>
<th>Remarkable effect</th>
<th>Effective</th>
<th>Invalid</th>
<th>Total effective rate</th>
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<tr>
<td>Contour improvement</td>
<td>64</td>
<td>19</td>
<td>1</td>
</tr>
<tr>
<td>skin texture improvement</td>
<td>46</td>
<td>31</td>
<td>2</td>
</tr>
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Table 3. Patient satisfaction evaluation

<table>
<thead>
<tr>
<th></th>
<th>Excellent</th>
<th>Good</th>
<th>Dissatisfaction</th>
<th>Total Satisfaction Rate</th>
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</thead>
<tbody>
<tr>
<td>Contour improvement</td>
<td>42</td>
<td>40</td>
<td>2</td>
<td>97.6</td>
</tr>
<tr>
<td>Skin texture improvement</td>
<td>30</td>
<td>50</td>
<td>4</td>
<td>95.2</td>
</tr>
<tr>
<td>Postoperative complications</td>
<td>24</td>
<td>52</td>
<td>8</td>
<td>90.5</td>
</tr>
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3. Discussion

Facial aging involves the whole layer of facial tissues and usually starts at the age of 30. Female aging will accelerate before and after menopause, manifested by decreased skin elasticity, soft tissue saggy, and bone iliac and soft tissue atrophy [1]. Facial rejuvenation refers to various means and methods that can restore the youthful appearance of the aging face. The early facial rejuvenation surgery only relied on the lifting procedure, and did not pay attention to soft tissue atrophy, ligament relaxation and skin aging after facial aging. How to improve treatment satisfaction through comprehensive treatment is the focus of research on youth.

The true facial ligament is issued from the periosteum surface through the SMAS layer to the dermis, which is issued from the bone suture to fix the facial tissue on the bone. With the growth of age, the ligament loosens, coupled with the absorption of bone and deep fat, which cannot effectively lift and hold the facial tissue, resulting in fat moving down and skin sagging. The loosening of the orbital ligament will cause drooping eyes, bags and lacrimal channels; the loosening of the zygomatic ligament causes facial tissue to sag, forming Indian lines and deepening of the nasolabial fold. The loosening of the buccal maxillary ligament causes the soft tissue of the midface to atrophy and move downward; the mandibular ligament plays a role in fixing and suspending the facial and neck skin of the mandibular body to maintain the curve of the neck and jaw [8]. Some studies have reported that injection of fillers for the treatment of loose facial ligaments has a good effect on improving facial rejuvenation [9]. For the four true facial ligaments: The “Rivet lifting injection technique” is to inject hyaluronic acid into the position of the subcutaneous ligament support along the direction of the human body’s own bones and ligaments, allowing the expansion effect of hyaluronic acid to create a new support point. Thus the loose soft tissue is propped up to achieve the visual effect of lifting the whole face.

Facial space is filled with deep fat pad, and the depression and collapse of deep fat pad lead to the loss of facial volume, resulting in relaxation and sagging of our face [10]. Retrograde sector injection technique is a gap lifting injection of facial fat pad. The superficial temporal and middle temporal space was used to fill the temporal region and lift the eye area, the zygomatic anterior space was used to lift the apple muscle, the masseter anterior space was used to lift the whole middle and lower face, the piriform fossa space and the mandibular anterior space were used to lift the oral area, so as to achieve a more lasting and effective lifting effect.

Skin aging refers to the functional aging damage of the skin. Aging skin often weakens its protection ability, regulation ability and adaptability to changes in the external environment, accompanied by changes in skin shape, color, texture and other conditions [11]. Roller microneedle is a microneedle array device with axis, which is widely used in the field of skin treatment [12-14]. The outermost layer of the skin is the epidermis, which can be constantly renewed. Needle rolling therapy can be located, fixed layer and quantitative lead the active ingredients or nutrients into the subcutaneous tissue, and a variety of nutrients and active ingredients can be rapidly absorbed by the skin and play a role. Microneedles allow nutrients to pass through by destroying the cuticle layer and creating pores that can be evenly distributed horizontally across the pores of the skin. In addition, microdamage itself can stimulate hyaluronic acid synthesis by up-regulating the expression of hyaluronic acid synthase. Meanwhile, mechanical stretching stimulation after nutrient injection activated fibroblasts and indirectly stimulated fibroblasts to increase collagen production by inducing the expression of connective tissue growth factor and transforming growth factor β. In clinical practice, we need to take different intensities of treatment according to the skin condition, treatment purpose, course of treatment and individual differences.

The dermis of the skin is composed of the papillary layer and three major fibers (elastic fibers, collagen fibers, and reticular fibers). With the growth of age, the amount of collagen fiber synthesis in human body decreases, resulting in poor support of dermis to the epidermis, thus forming fine lines on the epidermis [11]. Collagen has a remarkable effect on skin care and has good efficacy in many aspects, such as moisturizing, nourishing, whitening, firming, anti-wrinkle and repair [15]. By injecting collagen into the dermis, it can shrink pores, moisturize skin, improve skin tone, and remove wrinkles [16-19]. Collagen injection in dermis combined with needle rolling thera-
py from different layers of the skin can not only improve skin tone and texture, but also significantly reduce dry lines and make the skin firm, providing a better combined treatment plan for facial rejuvenation.

In conclusion, overall facial rejuvenation usually requires a combination of the treatment of the epidermis and dermis with the treatment of ligaments and deep fat pads, which is what I call E-D-D-L four-dimensional positioning precision injection. Of course, every treatment should not be excessive, so as not to bring psychological and physical burden and pressure to beauty seekers.

Acknowledgements

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References