Can a Surgery-First Orthognathic Approach Reduce the Total Treatment Time?

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INTRODUCTION: A traditional orthognathic approach requires presurgical orthodontic treatment for an average of approximately 17 months,1 followed by surgery and postsurgical orthodontic treatment for approximately 6–12 months. Therefore, the total treatment time for the conventional orthognathic approach takes approximately 18–36 months.2–4 Because traditional orthognathic surgery requires 2–3 years to complete, it is a rarely adopted procedure. Therefore, shortening the total treatment time would be extremely beneficial for patients. Although presurgical orthodontic treatment has been approved as an inevitable process for stable orthognathic correction before surgery, recent advances in the application of mini-screws and presurgical simulation orthodontic management skills on a dental model show that it is possible to perform a surgery-first orthognathic approach without presurgical orthodontic treatment.5

MATERIALS AND METHODS: We assessed 45 consecutive Asian patients with skeletal class III dentofacial deformities with surgery-first orthognathic surgery compared to 52 patients with conventional two-jaw orthognathic surgery. Using cephalometric landmark data for the patients with a surgery-first approach, we analyzed postoperative changes in vertical and horizontal facial, denture, and soft tissue patterns. Assuming that tooth extraction is a factor that affects the total treatment time, both groups were divided into two subgroups.

RESULTS: The treatment duration of the surgery-first group was significantly less than that of the orthodontics-first group. Overall, the analysis revealed that the total treatment time period in the surgery-first orthognathic approach averaged 14.6 months compared to 22.0 months of treatment in an orthodontics-first orthognathic approach. Among the surgery-first cases without tooth extraction, the average treatment interval was only 13.6 months versus 24.8 months for the six that required tooth extraction (p < 0.001). In contrast, the average treatment period of traditional orthodontics-first cases without tooth extraction was roughly comparable to the nine cases that required tooth extraction (21.7 months vs. 21.6 months, respectively). The difference between immediate postoperative and preoperative, postoperative and immediate postoperative cephalometric data revealed factors that have correlation with total treatment duration.

CONCLUSION: Surgery-first orthognathic surgery can dramatically shorten the total treatment time with no major complications. By analyzing the cephalometric landmark data we identified several possible factors that have an effect on the total treatment time.

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REFERENCES:

1. Luther F, Morris DO, Hart C: Orthodontic preparation for orthognathic surgery: how long does it take and why? A retrospective study. Br J Oral Maxillofac Surg 41:401–406, 2003.
2. Van Sickels JE, Loftus MJ, Weiss WW, Jr: Orthognathic surgery: a team approach. Bull Phila Cty Dent Soc. 45:8–9, 1979.
3. Slavnic S, Marcusson A: Duration of orthodontic treatment in conjunction with orthognathic surgery. Swed Dent J. 34:159–166, 2010.
4. Dowling PA, Espeland L, Krogstad O, Stenvik A, Kelly A: Duration of orthodontic treatment involving orthognathic surgery. Int J Adult Orthodon Orthognath Surg. 14:146–152, 1999.
5. Choi JW, Lee JY, Yang SJ, Koh KS: The reliability of a surgery-first orthognathic approach without presurgical orthodontic treatment for skeletal class III dentofacial deformity. Ann Plast Surg. 74:333–341, 2015.
METHODS AND MATERIALS: Sprague Dawley rats were injected subcutaneously with two HA fillers, VYC-20L [20 mg/mL] or HYC-24L+ [24 mg/mL], to create a projecting bolus. Four days post-injection, recombinant human hyaluronidase (HX) or ovine hyaluronidase (VIT) were administered at varying dose levels (5U/0.1mL bolus, 10U/0.1mL bolus, and 30U/0.1mL bolus). 3D images were captured to quantify the loss of projection at six time points over 72 hours. Histology was performed to confirm degradation at 2 weeks post-administration.

RESULTS: For both HA fillers, complete loss of projection was achieved with the highest dose of HX and VIT. More projection (i.e. less degradation) was detected with the lower doses of HX and VIT. No significant differences in the resulting projection were observed when comparing the effect of HX to VIT (at any dose level) or the degradation response of VYC-20L or HYC-24L+ to either hyaluronidase. The histology showed significant loss of filler material at 2 weeks, with minimal amounts of filler observed.

CONCLUSION: The in vivo susceptibility of HA fillers to hyaluronidase-induced degradation has not been investigated previously. This novel animal model evaluated the susceptibility of fillers with different physicochemical properties to commercially-available hyaluronidases. Using an animal model allowed degradation to be evaluated while incorporating variables introduced by the biological environment (e.g. clearance, competing substrates for hyaluronidase). The results showed that the projection detected by 3D imaging was able to be reduced to non-detectable levels for both fillers. A dose-dependent response was observed, suggesting that the amount of degradation can be varied. Additionally, the same degree of degradation was observed for both commercially-available hyaluronidases and, despite differences in physicochemical properties, the same degree of degradation was achieved for both VYC-20L and HYC-24L+.

INTRODUCTION: Nasolabial complex (NLC) rejuvenation with injectables is limited by densely adherent peri-oral and nasolabial crease tissues. Release of myodermal attachments may create a potential space for filler deposition, attenuating deep nasolabial creases associated with aging. Incisionless separation of these attachments has been described using subcision wires1. Adjunctive filler injection may promote a youthful nasolabial contour2. The anatomic basis for these techniques is not fully defined. This study histologically describes nasolabial wire subcision with and without filler placement compared to filler injection alone.

METHODS: Of fourteen NLCs in seven fresh cadavers, eleven NLCs were subcised (SurgiWire Incisionless Dissector, Coapt Systems, Inc.), eight also underwent filler injection. One NLC was injected without subcision. Two were controls (no intervention). Injectable silicone (Dragon Skin, Smooth-On, Inc.) simulated dermal filler, and 2mL were injected per NLC. Full thickness portions of the lip and cheek containing the NLC were excised. Specimens were sectioned perpendicular to the nasolabial crease, stained with Masson’s trichrome, then assessed in thirds (upper, middle, and lower).

RESULTS: Mean cadaver age was 72.7 years. Five (71%) were female. Mean length of the nasolabial crease was 41.2mm. Subcision/filler cavities were localized to a plane superficial to the facial mimetic musculature in 80.6% of sections. When compared to subcision alone, subcision combined with silicone filler generated larger, smooth-walled subcision cavities with division of myofascial elements. Filler injection without subcision resulted in irregular silicone deposition amongst multiple filler cavities. Vessels in excess of 300um diameter were disrupted in 3 specimens (25%) and 13 sections (14.1%). Vessel disruption was more frequent in the middle and lower thirds of the NLC, and 61.5% of vessel disruptions were observed during filler injection without subcision. Vessels exceeding 1000um diameter were identified in 5 specimens (35.7%) and 13 sections (8.4%). These larger vessels were always inferior or lateral to the subcision/filler plane, and in the middle/lower thirds of the NLC. No large vessel disruptions or intravascular filler were observed.

CONCLUSIONS: Wire subcision reproducibly divides muscular and connective tissue attachments to the nasolabial crease. Vessel disruption during subcision was uncommon, more frequently observed in the middle/lower thirds of the NLC. Vessels exceeding 1000um diameter were more frequently observed in the lateral aspect of the lower third of the NLC which is considered a vascular danger zone.

Anatomic and Histologic Investigation of Nasolabial Rejuvenation with Wire Subcision and Adjunctive Filler Injection

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