Biomechanical Analysis of Anchoring Points in Rhytidectomy

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Objective: To quantify tissue tearing force at various anchoring points on the face.

Methods: This is a prospective anatomic study using 4 fresh cadavers of persons aged 60 to 70 years at the time of death, for a total of 8 sides. Standardized 1-cm distances were measured at the various anchor points, and a single 0 Prolene suture loop was tied at each standardized anchoring point. Steady force was applied perpendicular to the plane of the face with a digital hanging scale. The scale was pulled until the suture ruptured the tissue at the anchoring point. The values at which the tissue ruptured were recorded, averaged, and compared.

Results: The average tissue force was 7.01 kg for the root of the zygoma vs 3.44 kg for the temporalis fascia (P < .05). The average tissue force was 5.50 kg for infralobular tissue vs 4.09 kg for tissue of the superficial musculoaponeurotic system located 1 cm anterior to the infralobular tissue (P < .05). The force for the fascia of the sternocleidomastoid was 3.89 kg vs 5.57 kg for the mastoid fascia (P < .05). There was a statistically significant difference between vertical bites of the temporalis fascia at 1.90 kg vs horizontal bites of the temporalis at 5.01 kg (P < .05).

Conclusion: The tissue tearing force varies by location on the face as well as suture orientation.


Almost all modern rhytidectomy techniques use suture suspension of deeper tissues to fixed points along the face. These fixed points can be termed anchor points because they provide the lifted tissue an anchor on which to suspend and thus prevent relaxation of the tissue to the original undesirable position. While some research has focused on the biomechanical properties of superficial musculoaponeurotic system (SMAS) flaps, composite flaps, and skin, we could not find a study that compared the physical properties of anchor points in face-lift surgery.

Anchoring points are selected based on a face-lift surgeon’s experience. During a face-lift operation, the surgeon has several choices for suspending and holding the lifted tissue. He or she may suspend the tissue superiorly to either the temporalis fascia or the periosteum of the zygoma. In their description of the minimal access cranial suspension (MACS) lift, Tonnard et al1 tout the benefits of suturing to the periosteum of the zygoma. Along the lower portion of the face, the tissue can be suspended to either the infralobular soft tissue or the SMAS directly in front of it.

Finally, when suspending cervical elements of the face-lift, surgeons can suspend tissue to either the periosteum of the mastoid or to the sternocleidomastoid (SCM) fascia.

In this study, our goal was to objectively analyze these different anchoring points of the face for rhytidectomy and to measure the tearing forces of the tissue at each point. Statistical analysis of an anchoring point and its counterpart was performed with a 1-tailed paired t test.

Methods

Four fresh cadaver heads were used in this study from men and women older than 60 years at the time of death. A face-lift incision was marked out with a pen. The superior extent went into the temporal hairline while the mid portion went posttragal and postauricular. The incision then curved gently into the posterior hairline. A No. 10 scalpel was used to elevate the flap. The temporal flap was elevated on the surface of the superficial layer of the deep temporal fascia. The remainder of the flap was elevated in the subcutaneous layer.

A single surgeon performed the suture placement (M.A.C.). A 1-cm linear distance was measured, and a suture was thrown through the tissue prior to inducing tension. When a...
A total of 8 sides were tested on fresh cadavers. The force required to tear through the tissue was measured in kg per 1-cm suture bite (Table). The average tissue force was 7.01 kg for the zygoma vs 3.44 kg for the temporalis fascia. The average tissue force was 5.50 kg for the infralobular tissue vs 4.09 kg for SMAS located 1 cm anterior to the infralobular tissue. The average tissue tear force was 3.89 kg for the fascia of the SCM vs 5.57 kg for the fascia of the mastoid. The vertical bite sutures tore through the temporalis fascia at 1.90 kg whereas horizontal bite sutures tore through the temporalis fascia at 5.01 kg (Table). All comparisons were statistically significant (P < .05 for all).

**RESULTS**

Fixation points play an important role in most facial rejuvenation operations, including face-lifts, midface-lifts, and brow-lifts. Although the anchor points used for these procedures tend to be somewhat uniform among surgeons, little to no data exist on the relative strength of the tissues at these points.

One of us (A.R.S.) has noticed in revision cases that failure in a lift can result from a number of factors, 1 of which involves sutures tearing through tissues. We advocate complete release of tissues and facial ligaments in face-lift and brow-lift surgery to maximize results and decrease the overall force placed on the suspension sutures. It is important to note that we do not advocate excessive force with suspension of deeper tissue. We advocate thorough release of deeper tissues, including release of the masseteric ligaments, zygomatic ligaments, mandibular ligaments, and cervical elements to minimize tension and undue force along facial tissue. Even with ad-
provide a longer-lasting, more stable result. In cases where a larger amount of tension is needed, the surgeon can be more comfortable placing sutures in areas where more tension can be held. The difference in tensile strength of the various tissues examined has implications for both the aesthetic surgeon and the reconstructive surgeon.

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REFERENCES