were measured per surgery (n=23). Demographics, medical information, operative notes, and post-operative clinic notes were collected from chart review. A phone survey was used to assess pre- and post-operative symptoms based on the validated Raynaud Condition Score (RCS), initial response to AFG, long-term symptom relief, and satisfaction.

RESULTS: Digital ulcers were present prior to AFG in 65% of surgeries, the average RCS was 5.8 (scored 0-10), and patients experienced an average of 3.5 cold attacks per day that lasted for 19.2 mins with an intensity of 2.0 (scored 0-3). At peak response level 83% of surgeries improved Raynaud’s symptoms and 87% of those with ulcers reported healing. Diminished symptom relief following peak response was reported in 70% of surgeries, but in 81% of those cases symptoms at follow-up were still better than before AFG. At follow-up (defined as time of survey or time of presentation for subsequent AFG), the average RCS was 3.5 (delta -2.3, p<0.01), frequency of cold attacks was 2.4 per day (delta -1.1, p<0.01), duration was 13.7 mins (delta -5.4, p<0.01), and intensity was 1.1 (delta of -0.9, p<0.01). Younger age and primary Raynaud’s correlated with larger improvements in RCS (p<0.05). Average follow-up was 2.9 years from AFG; 2.5 for surgeries with eventually diminishing symptom relief and 3.9 for those without. Diminishing symptom relief with symptom recurrence at 0.5, 1, and 2 years was observed in 30%, 52%, and 64% of surgeries. Median duration of maximum symptom relief was 10.5 months post-operatively. Patients with no ulcers prior to AFG (OR 0.43), higher BMI (26.2 vs. 22.6), and non-White race (OR 0.40) were less likely to experience diminishing symptom relief (p<0.05). In addition, patients with primary Raynaud’s were less likely to experience diminishing symptom relief than those with CREST or systemic scleroderma (33% vs. 50% vs. 91%, p<0.10). Average patient satisfaction with AFG was 7.2/10, and 91% would recommend AFG to others.

CONCLUSION: AFG is an effective, albeit sometimes temporary, treatment for Raynaud’s and digital ulcers. Certain subsets of patients may be more likely to experience lasting symptom relief beyond 1 year.

TRACK: HAND AND UPPER EXTREMITY
Redefining the Pulley System of the Thumb: Back to the Anatomy Lab

Presenter: John M. Sullivan, MD

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PURPOSE: The pulley system is a subject of increasing interest in recent literature. Despite centuries of anatomic descriptions, debate persists around these structures. The A0 pulley (often called palmar aponeurosis) is a structure widely accepted in digits 2-5. Wu et al.2 describe the A0 as a primary cause of trigger finger in>30% of cases; Hetzler et al.1 report in a randomized controlled trial the A0 pulley contributes to~55% of trigger fingers; neither of these studies references the thumb. Marek et al.3 describe ‘any proximal bands of tissue (an A0 pulley)’ as a potential contributor in pediatric trigger thumb but do not provide clear anatomic description of this structure. We offer a complete anatomic description of the pulley system of the thumb with specific interest in characterizing if and when there is an ‘A0 pulley.’

METHOD: Twenty-four hands on 12 cadavers were dissected exposing the pulley system of the thumb from distal phalanx to thenar musculature. The known pulleys were cataloged as A1, A2, Aob and A2 pulleys. Any distinct transverse structural consolidation overlying the flexor tendon proximal to the A1 pulley was recorded.

RESULTS: Consistent with accepted thumb anatomy, all specimens demonstrated A1, Aob, and A2 pulleys and 20/24(83.3%) had Avariable pulleys; one thumb had two oblique pulleys. A well-defined, proximal, transverse structure clearly delineated from the A1 pulley was observed in 15/24(62.5%) thumbs. Bilateral A0 pulley was observed in 5/12(41.6%) cadavers; unilateral A0 pulley was observed in 5 cadavers(41.6%); 2 cadavers(16.7%) had no A0 pulley. The A0 pulleys ranged in size from 2-5mm in width and 0.5-1.2mm in thickness.

CONCLUSION: The presence of consolidated transverse fibers termed ‘A0 pulley’ was observed in the majority of specimens(15/24, 62.5%). Based on these findings, we feel confident in anatomically describing the A0 pulley as a unique anatomic structure of the thumb pulley system. Only 50% of cadavers demonstrated bilateral A0 anatomy, introducing a challenge in predicting contralateral pathology in patients without direct investigation. The thumb’s A0 pulley could easily be missed in-vivo and not released during trigger thumb surgery leading to persistent symptoms. Given the growing literature suggesting a prominent role of the A0 pulley for digits 2-5 in trigger finger pathology, the observation of a distinct A0 pulley in the thumb should be considered by hand surgeons when treating trigger thumb.

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TRACK: SURGICAL PEARLS
Auricular Reconstruction: Modifications to Classification and Surgical Approach

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PURPOSE: One of the primary treatments for microtia is two-stage autogenous auricular reconstruction. The first stage involves a costal cartilage framework inset, and the second stage elevates the framework using fascial flaps, wedge cartilage grafts, and skin grafts. We present modifications to the conceptual classifications and surgical approach to auricular reconstruction with a focus on small concha-type microtia.

MODIFICATION OF TECHNIQUE: 1) Microtia is classified into four sub-categories: lobule type, conchal type, small concha-type, and anotia. Planning the surgical approach begins with accurately identifying the category. Small concha-type microtia is often overlooked or thought to be a simple indentation in the conchal bowl region. The small concha is often a cavity, instead of an indentation, and located anteriorly to the normal conchal bowl. 2) The proper location of the ear can be determined by constructing an ‘auricular rectangle,’ a term coined by the senior author that utilizes multiple topographic references of the unaffected side in unilateral microtia: top of upper helix, caudal end of lobule, Frankfurt Horizontal line, shape of hairline, and face mask. If the face is asymmetrical like in severe hemifacial microsomia, identification of the auricular rectangle is more challenging and perfect symmetry is less attainable. Identifying the proper location of the ear is crucial to gauge if the vestige is in a surgically usable location. 3) Surgical technique has evolved from a V- to W-shaped incision along the posterior surface of the auricle to maximize the skin surface area and create the deep concha. The W-shape also creates a superior advancement of the vestige. If the vestige is located at the same height as the unaffected side, the flap is more U-shaped. Additionally, the W-shape can be made asymmetric to create the desired 10-15 degree posterior inclination of the ear framework. 4) The hallmark of small concha-type microtia is that the small concha is not located in the correct anatomic location, so the skin flap elevated off the indent is too anteriorly positioned to be used for the tragus as much of the literature suggests. The small concha skin pocket should instead be excised. 5) After vestigial cartilage is removed and the cartilage framework is inserted around the subcutaneous pedicle of W-flap, the anterior lobule flap and transposed W-flap are closed. Temporary suction is applied to adhere the skin envelope to the framework. The final location and posterior inclination of the ear is determined, which reveals the areas of redundant skin, typically the anterior helix. Although conventional teachings do not include skin trimming, the senior author finds that horizontal wound closure has been successful in providing uninterrupted blood supply while preventing ischemia after years of training under Satoru Nagata and years of independent practice.

CONCLUSION: These modifications advance our understanding of microtia classifications and how the surgical approach can be tailored to best utilize each component of the vestige. The functional outcomes of auricular reconstruction are especially important in light of the coronavirus disease 2019 (COVID-19) pandemic where the ability to wear masks relies on external ear function.