RESULTS: Mean age at the time of reduction mammaplasty was 17.9 ± 1.7 years. Patients with macromastia demonstrated significant score improvements postoperatively from baseline on the RSES, BRSQ, and in seven out of eight SF-36 domains. Postoperative subjects scored significantly higher than controls at follow-up on the RSES and in four SF-36 domains (physical functioning, bodily pain, social functioning, and mental health), when controlling for differences in baseline BMI category ($p<0.05$, all). Follow-up scores on the EAT-26, BRSQ, and in four SF-36 domains (role-physical, general health, vitality, and role-emotional) did not differ between the two groups ($p\geq0.05$, all). Following reduction mammaplasty, the proportion of patients experiencing pain, bra strap grooving, inframammary intertrigo, and difficulty participating in sports and finding properly fitting bras/clothing was significantly lower than at baseline ($p<0.001$, all), with postoperative rates similar to those seen in control subjects ($p\geq0.05$, all). Both younger (<18 years, n=54) and older patients (≥18 years, n=48) had significant postoperative improvements in RSES and BRSQ scores. On the SF-36, only older patients experienced a benefit in the mental health subscale ($p<0.001$). When the macromastia group was stratified by BMI category, both healthy-weighted (n=38) and overweight/obese patients (n=64) had significant postoperative improvements on the RSES and BRSQ, and six SF-36 domains. Unlike their healthy-weighted counterparts, overweight/obese patients did not have improvements in SF-36 general health (p=0.65).

CONCLUSION: Reduction mammaplasty was significantly associated with improvements in HRQOL and breast-related symptoms of adolescent patients. Postoperatively, patients report levels of well-being similar to, if not higher than, unaffected age-matched females. These results largely do not vary by BMI category or age. Patients and providers should be aware of the potential benefit of reduction mammaplasty for adolescents with symptomatic macromastia.

18

Creating a Low Profile Anchor to Eliminate High Profile Suture Knots

Jason L. Green, BS[1], Mario Padelli Chee, BS[2], Fangqi Gu, BS[3], Jane Hung, BS[2], Alissa Ebong, BS[3], Mohamed Ibrahim, MD[4], Jeremy Martinez, BS[5], Richard Glisson, BS[6], Sabino Zani, Jr., MD[7], Ken Gall, PhD[8], Howard Levinson, MD[9]

[1]Duke University School of Medicine, Durham, NC, [2]Duke University Pratt School of Engineering, Durham, NC, [3]Duke University Department of Biomedical Engineering, Durham, NC, [4]Division of Plastic and Reconstructive Surgery, Department of Surgery, Duke University School of Medicine, Durham, NC, [5]Duke University, Durham, NC, [6]Department of Orthopedic Surgery, Duke University Hospital, Durham, NC, [7]Department of Surgery, Duke University Hospital, Durham, NC, [8]Duke University Department of Mechanical Engineering and Materials Science, Durham, NC, [9]Division of Plastic and Reconstructive Surgery, Department of Surgery, Duke University Hospital, Durham, NC

PURPOSE: Large sutures, such as mesh suture or tape suture, are used in hernia and tendon repair and have shown enhanced mechanical performance compared to smaller suture. However, a limitation to the use of large suture is knot size. Large sutures produce high profile knots that are susceptible to palpability, infection, and increased foreign body response. The goal of this study was to use 3D printing to develop an anchoring device to replace suture knots. The device was designed to be low profile and to have superior mechanical performance to a knot.

METHODS: Flat, cylindrical anchor prototypes were iteratively created using 3-D design software (SolidWorks®) and 3D printed from a Carbon3D printer using liquid polymer resin. After testing multiple iterations of the device, we settled on a male component with four horizontal posts that integrate into opposing holes of a female component. The posts were placed through pores of a hernia mesh, providing multiple fixation points. Each post was designed with a distal element to serve as a locking mechanism when approximated to the female component. The profile of the anchor was compared to that of a large suture knot (mesh extension, 1cm diameter, 4 throws). Next, monotonic tensile testing of the anchor vs. a knot control in a silicone gel model was performed using an Instron in accordance with ASTM D5034. Failure load and mode of failure were recorded and compared. This was followed by cyclic tensile testing of the anchor and knot control at a range of 10 to 20N (maximum physiologic force on the abdomen is 16N/cm^2) at 1Hz for 200 cycles, then pull to

failure at a rate of 300mm/min. Cycles until failure, failure load, and mode of failure were recorded.

RESULTS: The profile of the suture anchor (27.5mm^2) was ~50% smaller than the large suture knot (50 mm^2). During monotonic tensile testing, the anchor had a significantly greater failure load (58 ± 11N) in comparison to the knot control (31 ± 13N) (P< .05). The most common modes of failure were anchor fracture (post breakage) and suture tearing for knot failure. During cyclic tensile testing, the anchor's failure load (56 ± 8N) was significantly higher than the knot control (30N ± 8N) (P< .05). The most common modes of failure were anchor fracture and knot sliding through the suture tract. The anchor consistently sustained 200 cycles while the knot failed at an average of 134 cycles.

CONCLUSIONS: The anchoring device is lower profile than a knot and demonstrates superior mechanical performance. The anchor experiences a significantly greater load at failure in both monotonic and cyclic testing. Additionally, it consistently sustains 200 load cycles, indicating durability. Future efforts will focus on minimizing the anchor profile, creating an anchor applicator for open and laparoscopic applications, and modifying the post mechanism for translation to other suture types.