Creating Tissue Engineered Nipples Using 3d-printed Poly-4-hydroxybutyrate (p4hb) Bioabsorbable Scaffolds Augmented With Autologous Processed Costal Cartilage

Xue Dong, MD, PhD1, Ishani Premaratne, BA1, Mariam Gadjiko, BA1, Nabil Berri, MD1, Skander Limem, PhD2, Kemal Saribrahimoglu, PhD2, Jeffrey Scott, PhD2, Jason Spector, MD1.

1Weill Cornell Medicine, New York, NY, USA, 2Tepha, Inc., Lexington, MA, USA.

Purpose: Nipple reconstruction is a vital part of breast reconstruction after total mastectomy. However, nearly all autologous tissue techniques utilized for reconstruction of the nipple are hindered by scar contracture and loss of projection of the neo-nipple. Unfortunately, engineered tissue substitutes, such as Cook Biodesign® nipple reconstruction cylinders, have demonstrated suboptimal projection maintenance over time. Costal cartilage (CC) has been described in nipple reconstruction to maintain projection, yet has not been adopted due to the excessively firm nipple that results. Herein we propose using 3D-printed bioabsorbable P4HB (3D-P4HB) scaffolds loaded with processed CC in order to foster ingrowth of tissue that mimics the biomechanical properties of native nipples and to protect the regenerated tissue from contracture as it matures.

Methods: 3D-P4HB scaffolds (diameter: 1.0cm, height: 1.0cm) were fabricated and sterilized. Patient-derived CC (discarded from DIEP procedures) was either minced (1mm³) or zested (<0.2mm³) in sterile fashion. Processed cartilage-filled 3D-P4HB scaffolds were subcutaneously implanted into nude rats using a CV flap technique. Additional groups consisted of empty 3D-P4HB scaffolds, 3D-P4HB scaffolds with an internal 3D latticework of P4HB filaments (rebar), and non-scaffolded (naked) cartilage. The constructs were explanted at 1, 3 and 6 months, and evaluated by gross, microstructural, histological, and biomechanical analysis.

Results: All 3D-P4HB nipple reconstructions were well preserved in diameter and projection at 1, 3 and 6 months, primarily due to the persistence of the scaffold architecture throughout these time points. When compared to the non-scaffolded (naked) group, 3D-P4HB groups demonstrated significantly greater projection at 3 and 6 months (p<0.05). There were no significant differences observed in tissue volume retention between the two processed cartilage-filled 3D-P4HB groups at 1, 3 and 6 months. However, the non-scaffolded (naked) group lost a significant amount of volume in the first 3 months (38% in minced and 26% in zested, p<0.05), but remained unchanged between 3 and 6 months. Newly formed spongy fibrovascular cartilaginous tissue (with viable chondrocytes within the lacunae) was also noted in processed cartilage-filled 3D-P4HB groups. Interestingly, 3D-P4HB (rebar) scaffolds demonstrated the fastest material absorption overtime, as demonstrated by biomechanical testing and SEM analysis which verified widespread pitting on the material surface. Elastic modulus testing indicated minimal change in 3D-P4HB (rebar) scaffold stiffness at 1 month, yet a sharp decrease from 8MPa to 4MPa between 1 to 3 months. Both processed cartilage-filled 3D-P4HB scaffolds slightly increased in stiffness over 6 months within the range of 2 to 3MPa (p>0.05).

Conclusion: Using 3D-P4HB scaffolds filled with autologous processed CC, we have engineered nipples that maintain their projection and volume over time, while simultaneously allowing for the maturation of an internal structure of fibrovascular cartilaginous tissue that biomechanically mimics that of native nipples. As the 3D-P4HB scaffold gradually absorbs, data suggest that newly-regenerated tissue may resist scar contracture and maintain projection over time. Because P4HB devices for soft tissue reinforcement have previously been cleared by the FDA and possess a long track record of safety, we believe that this novel 3D-P4HB nipple reconstruction scaffold may be readily translatable to the clinic.

QUICK SHOTS

QS1

Regret After Gender Affirmation Surgery: A Systematic Review And Meta-Analysis Of Prevalence

Valeria P. Bustos, MD1, Samyd S. Bustos, MD2, Joseph M. Escandón, MD3, Andres Mascaro, MD4, Gabriel Del Corral, MD, FACS5, Miguel Angel Gaxiola-García, MD, MSc6, Beatriz Hatsue Kushida-Contreras, MD7, Howard N. Langstein, MD8, Oscar J. Manrique, MD, FACS8
**1Pontificia Universidad Javeriana, School of Medicine, Bogotá, Colombia, 2Division of Plastic and Reconstructive Surgery, Mayo Clinic, Rochester, MN, 3Division of Plastic and Reconstructive Surgery, Children’s National Hospital, Washington, D.C., WA, 4Department of Plastic and Reconstructive Surgery, Cleveland Clinic, Weston, FL, 5Department of Plastic and Reconstructive Surgery, MedStar Georgetown University Hospital, Washington, D.C., WA, 6Department of Plastic and Reconstructive Surgery, Mexico’s Children Hospital “Federico Gómez”, Ciudad de México, Mexico, 7Department of Plastic and Reconstructive Surgery, Mexico’s General Hospital, Ciudad de México, Mexico, 8Division of Plastic and Reconstructive Surgery, University of Rochester Medical Center, Rochester, NY**

**Purpose:** There is an unknown percentage of transgender and gender non-confirming individuals who undergo gender affirmation surgeries (GAS) that experiences regret. Regret could lead to physical and mental morbidity, also questioning the appropriateness of these procedures in selected patients. The aim of this study is to evaluate the prevalence of regret in transgender individuals who underwent GAS and evaluate associated factors.

**Methods:** A systematic review was conducted following the PRISMA guidelines. A comprehensive research strategy was performed including the following databases: Ovid MEDLINE(R) and Epub Ahead of Print, In-Process & Other Non-Indexed Citations, and Daily, Ovid EMBASE, Ovid Cochrane Central Register of Controlled Trials, Ovid Cochrane Database of Systematic Reviews, and Scopus. Random-effects meta-analysis of proportions, subgroup analysis, meta-regression, publication bias, and sensitivity analyses were performed.

**Results:** A total of 27 studies, pooling 7,928 transgender patients that underwent any type of GAS were included in this review. The pooled prevalence of regret after GAS was 1% (95% Confidence interval [CI] <1-2%). Overall, 33% underwent transmasculine surgical procedures and 67% transfeminine procedures. The prevalence of regrets among patients undergoing transmasculine and transfeminine surgeries was <1% (IC<1<1%) and 1% (CI<1-2%), respectively. A total of 77 patients regretted having had GAS. Of them, 28 had minor and 34 had major regrets based on Pfäfflin’s regret classification. The majority of these had “clear regret” based on Kuiper and Cohen Kettenis’ classification.

**Conclusion:** Based on this review, there is an extremely low prevalence of regret in transgender patients after GAS. We believe this study corroborates the improvements made in regard to selection criteria for GAS. However, there is high subjectivity in the assessment of regret and lack of standardized questionnaires, which highlight the importance of developing validated questionnaires in this population.

**QS2**

**Aberrant Breast Adipose Stromal Cell Biology In Women At High Risk For Developing Breast Cancer**

Mahsa Taskindoust, BS1, Tingjun Xie, MD2, Valery Nelson, MS3, Bryanna Stukes, MHS1, Scott Hollenbeck, MD3, Robin Bachelder, PhD3.

1Duke University School of Medicine, Durham, NC, USA, 2Plastic Surgery Hospital, Peking Union Medical College, Beijing, China, 3Duke University Medical Center, Department of Surgery, Division of Plastic, Maxillofacial, and Oral Surgery, Durham, NC, USA.

**Purpose:** Our laboratory studies contributions of breast adipose stromal cells (bASCs) to breast cancer initiation and progression. To date, most studies of ASC biology have focused on abdominal ASCs. We hypothesize that bASC biology impacts the breast microenvironment in a manner that influences a woman’s risk of developing breast cancer.

**Methods:** In order to better understand how aberrant bASC biology contributes to breast cancer, we built a bASC cell repository from women undergoing mastectomies at Duke University Hospital (Duke IRB Pro00100739). Some of these women are at high risk for developing breast cancer.