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**INTRODUCTION:** Despite great advances in the treatment of pediatric burns, useful prognostic markers are sparse. During the past years, there has been increasing interest in circulating plasma cell free DNA (CFD) as a potential marker for tissue injury; however, current methods for CFD analysis are impractical for routine laboratory use due to the cost and time needed to perform them. We have developed a novel rapid direct fluorescent assay for CFD quantification that allows obtaining accurate, fast and inexpensive measurements, and already published its potential use in quantifying admission CFD levels as a prognostic factor in adult burns. The aim of this study was to use this technique for measuring admission plasma CFD levels in pediatric burn patients and explore the use of CFD as a potential marker and prognostic factor in pediatric burns.

**METHODS:** A single center, single arm, prospective study, approved by the Institutional Review Board was performed. Plasma CFD levels were obtained at admission from otherwise healthy hospitalized pediatric burn patients, 0–18 years old, within 24 hours of injury. DNA levels were quantified using the fluorochrome SYBR Gold technique which does not require prior processing of samples, that is, DNA extraction and amplification. The method was tested in comparison with the gold standard, quantitative PCR and was found to be in good correlation of $R^2 = 0.9987$ ($P < 0.0001$). Variables recorded and compared included demographic data, burn cause and depth, TBSA, hospitalization days and surgical intervention.

**RESULTS:** The study included 16 pediatric burn patients, 8 female and 8 male, aged 4.0 ± 1.83 years old, the majority (12/16 = 75%) suffering from scald burns. The average TBSA involved was 15.4% ± 13.0%, and the average hospitalization was 15.6 ± 15.5 days. The average CFD level was 1,747 ± 1,732 ng/ml. There was a significant correlation between CFD levels and hospitalization days ($R^2 = 0.31$, $AUC = 0.854; P = 0.027$). We did not find significant correlations with TBSA and burn depth, however, we found a strong significant correlation between CFD levels and hospitalization days ($R^2 = 0.51$, $AUC = 0.98; P = 0.002$). There was also a significant correlation between CFD levels and the number of surgical procedures ($R^2 = 0.6; P = 0.02$).

**CONCLUSIONS:** Admission CFD levels may serve as a prognostic factor in pediatric burns. Larger patient groups are needed in order to further strengthen these results.

**Mechanical Stretch Promotes Hypertrophic Scars Formation Through Mechanically Activated Ion Channel Piezo1**

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**BACKGROUND:** Hypertrophic scar (HS) formation is abnormal wound healing characterized by hyperactivation of fibroblasts and overproduction of extracellular matrix (ECM). To date, there are few satisfactory treatments. Mechanical stress has been shown to be a key etiological factor in HS formation while the underlying mechanism is not completely understood. Piezo1 was identified as the first mechanoresponsive ion channel in vertebrates, which has recently been emphasized on its mechanotransduction function in mechanics-related diseases. However, currently no research has focused on the biological function of Piezo1 in HS formation. Here we aim to assess the effect of stretch-induced Piezo1 activation on fibroblasts in vitro and HS formation in vivo.

**MATERIALS AND METHODS:** Human dermal fibroblasts were isolated and divided into 4 groups: control groups (with or without stretch) and GsMT × 4 (Piezo1 specific inhibitor) treated groups (with or without stretch). Cyclic mechanical stretch (10%, 24 hours, 0.5 Hz) was applied by the FlexcellFX-5000 system. Western blot was performed to assess the expression of myofibroblasts marker α-SMA and ECM components including collagen and fibronectin. Stretch-induced HS model on rat tail was established based on previous work and was treated with GsMT × 4 by intralesional injection. The scar hypertrophy evaluation was detected by H&E staining and Masson’s trichrome staining. α-SMA expression was confirmed by immunohistochemical staining.

**RESULTS:** The in vitro results showed that GsMT × 4-treated fibroblasts exhibited less expression of α-SMA, collagen I and fibronectin compared to nontreated fibroblasts.
after mechanical stretching. The in vivo results showed that GsMT × 4 treatment attenuated HS formation with reduced cross-sectional size of the scar (4.21 ± 1.08 versus 8.04 ± 1.55 mm²; *P* < 0.005) and decreased scar elevation index (1.69 ± 0.33 versus 3.08 ± 0.65; *P* < 0.005) compared with the control group. In addition, GsMT × 4-treated scars exhibited the downregulation of α-SMA expression compared with the control group (25.4% ± 1% versus 30.5% ± 2%; *P* < 0.005).

**CONCLUSION:** Mechanosensitive ion channel Piezo1 plays a significant role in fibroblasts activation and hypertrophic scarring under mechanical stretch. Piezo1 might be a novel therapeutic target for HS formation.

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**Comparison of Adipose Particle Size on Autologous Fat Graft Retention in a Rodent Model**

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**BACKGROUND:** Unpredictable retention outcomes remain a significant issue in autologous fat grafting procedures. Liposuction cannula variation leads to variability in fat particle size. Recent data suggest that the size of fat particles is closely related to graft healing outcomes; however, this remains a point of contention due to potential confounding variables such as tissue trauma with harvest. The aim of this study was to compare autologous fat grafting outcomes with variable fat particle sizes in an animal model which isolated fat particle size as the primary experimental variable. The overall goal of this work is to determine if reducing fat particle size is an effective method for enhancing graft retention in autologous fat grafting.

**METHODS:** The range of fat particle diameter harvested by 4 common liposuction cannulas was quantified to define relevant small and large particle target diameters. To determine if particle size impacted nutrient and oxygen permeability, small and large particles were incubated in vitro in a spinner flask with an abundance of culture media and VEGF secretion was measured with ELISA. Finally, small and large fat grafts were prepared from subcutaneous mouse fat pads and grafted in syngeneic Balb/CJ mice. Weight and volume retention were evaluated at 1, 4, 8, and 12 weeks. Histological analysis with Masson’s trichrome and perilipin immunofluorescent staining was performed. qRT-PCR was performed for adipogenic, inflammatory, and apoptotic genes.

**RESULTS:** The range of fat particle diameters harvested with 4 commonly used cannulas was 2–7 mm. In vitro studies showed that 5–7 mm particles had significantly increased VEGF secretion normalized to weight, indicating increased tissue hypoxia in these particles compared with 2–4 mm. Surprisingly, in vivo comparison in 2 unique studies showed 2–4 mm and 5–7 mm fat particles had comparable graft retention (*P* = 0.5329). Masson’s trichrome staining revealed increased extracellular matrix and fibrosis in the 5–7 mm particle group (*P* = 0.0115). Adipocyte survival with perilipin demonstrated comparable viability. Gene expression showed large particles experienced increased inflammation and apoptosis at 1 week after grafting, but overall there were no significant differences between groups.

**CONCLUSIONS:** The ideal fat particle size should be large enough to contain adequate mesenchyme while not so thick as to preclude imbibition. This study suggests that despite changes in hypoxia and VEGF levels, differing fat particles (2–4 mm and 5–7 mm) can achieve similar graft retention.

**An Inconvenient Truth of Clinical Assessment of Indeterminate Burns and Indocyanine Green Dye Angiography Precise Marking for Burn Excision: A Prospective, Multicentered, Triple-Blinded Study**