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Abdominal Weakness, Bulge Or Hernia After DIEP Flaps: An Algorithm Of Management, Prevention, And Surgical Repair With Classification

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Purpose: This study analyzes abdominal weakness, hernia and bulge following DIEP flap breast reconstruction. Abdominal wall morbidities are categorized, and an algorithm for management is provided.

Methods: A retrospective review of 718 patients who underwent abdominal based flap breast reconstruction between 2009 and 2018 was performed. Bulge and hernia were evaluated on exam and then by imaging and/or operative exploration. The incidence of abdominal weakness was evaluated by BREASTQ data. Risk factors were analyzed.

Results: Of the 644 patients included, 23 (3.6%) had a bulge or hernia on exam postoperatively. Developing an abdominal wound postoperatively and sacrificing nerves both correlated with an increased incidence of bulge or hernia (p < 0.05). The use of lateral row perforators, keeping the umbilicus, higher BMI and the use of mesh in the initial abdominal wall repair trended towards an increased incidence of bulge or hernia; however, this data was not statistically significant. Seven percent of patients who answered the BREAST-Q™ reported abdominal weakness. Patients in the umbilicus sacrificing cohort had an increased incidence of weakness (p < 0.05). Abdominal wounds, nerve sacrificing procedures and obesity correlated with an increased incidence of weakness; this data was not statistically significant.

Conclusions: Following analysis, a classification and algorithm for treatment of abdominal wall morbidity is provided. Abdominal wall morbidity is classified as: type 1 - abdominal weakness; type 2 - smaller, unilateral abdominal bulge; and type 3 - true abdominal hernia or large bilateral bulge. An algorithm of treatment is presented which includes physical therapy and surgical repair recommendations.

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Using 3d-printing And Imaging In Burn Mask Production

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Introduction: Burn masks serve as an essential treatment for the rehabilitation of patients following severe burns to the face. Unfortunately, the standard process of making custom facial orthoses typically requires plaster molding of the face. Especially in younger patients, this process can be painful, scary, and intolerable. To simplify this process, the authors propose the integration of 3D imaging and printing into the production of burn masks.

Methods: To alleviate risks to the patient, a stereographic image of the face is first captured with a 3D-imaging camera (Vectra M5, Canfield). Using these images, an accurate 3D-print of the patient’s face is created (uPrint, Stratasys). Orthotists are then able to use the printed model as a replica of the patient’s face to create the negative mold rather than having to subject the patient to the creation of an alginate model. A “test fit” acrylic mask is then created, which can manually be modified with heat for best fit on the plaster mold. Finally, thermogenic plastic is used as the final model for the patient.

Results: The application of this model on burn patients at our institution has proven to be a simple, quick, effective, and patient-friendly method which has both theoretical and practical advantages over traditional methods.

Conclusion: We report a successful method to produce burn masks using 3D imaging and printing.

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Revascularization Patterns Of Nerve Allografts In A Rat Sciatic Nerve Defect Model

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**Purpose:** The outcome of tissue transplantation critically depends on the revascularization process and consequently regeneration of nerve is similarly dependent on this process. The specific patterns of revascularization of allograft nerves after addition of vascularization remain unknown. The aim of this study was to determine the revascularization patterns of optimized processed allografts (OP A) after surgically induced angiogenesis to the wound bed in a rat sciatic nerve model.

**Methods:** In 51 Lewis rats, ten mm sciatic nerve gaps were repaired with (i) autografts, (ii) OP A and (iii) OP A wrapped in a pedicled superficial inferior epigastric artery fascia flap (SIEF) to provide vascularization to the wound bed. Nerves harvested from Sprague Dawley rats served as donors and were processed using a five-day decellularization protocol described by Hundepool et al (2017). At two, 12 and 16 weeks, the vascular volume and vascular surface area in nerve samples were measured using micro CT and photography, respectively. To describe the revascularization patterns in various parts of the nerve, cross-sectional images from micro CT imaging were obtained for the 12- and 16 week survival periods. The length of the nerve between both anastomoses was divided into three equal sections: proximal, mid and distal. Cross-sectional images were divided into three equally concentric rings.

**Results:** Starting at two weeks, vascularization consisting of a mesh-network occurred from both host stumps in nerve allograft and SIEF samples, leaving the middle part avascularized. Over time, the sprouted vessels reached to the middle parts of the nerve, more evident from the proximal than from the distal end. In nerve autografts, longitudinal running vessels were recognized, comparable to control. At two weeks, the vascular volume of SIEF nerves was comparable to control (P=0.1). The vascular surface area in SIEF nerves was superior to other groups (P<0.05). At 12 weeks, vascularity in SIEF nerves was significantly higher than allografts (P<0.05) and superior compared to all other groups (P<0.001) at 16 weeks. SIEF nerves had a significantly increased number of vessels compared to allografts alone in the proximal (P<0.05) and mid-section of the graft (P<0.05). The number of vessels counted in all three rings was highest in SIEF nerves in the proximal and mid-section of the graft, compared to allografts. In the distal section of the nerve, a trend towards a higher number of vessels was seen in SIEF nerves, however, this was not significant.

**Conclusion:** Addition of surgical angiogenesis to the wound bed greatly improves revascularization. It was demonstrated that revascularization occurs primarily from proximal to distal (proximal inosculation) and not from both ends as previously believed and confirms the theory of centripetal revascularization.

**QS17**

**Heat-generating Nanoparticles For Selective Ablation Of Breast Cancer**

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**Purpose:** To describe the development and utilization of photothermal nanoparticles for detection and treatment of breast cancer.

**Methods:** Two different types of heat-generating nanoparticles, silver or polymer-based, were chemically synthesized and their optical and heat-generating properties were characterized. Both nanoparticle types were designed to absorb near infrared (NIR) light; for the silver nanoparticles a triangular shape was used and for polymers spheres were created because both the shape and chemical composition can impact the optical absorption and heat generation of nanoparticles. The polymer nanoparticles were composed of poly[4,4-bis(2-ethylhexyl)-cyclopenta[2,1-b;3,4-b’]dithiophene-2,6-diyl-alt-2,1,3-benzoselenadiazole-4,7-diyl] (PCPDTBSe) which generates heat upon NIR stimulation. This was combined with poly[(9,9-dihexylfluorene)-co-2,1,3-benzothiadiazole-co-4,7-di(thiophen-2-yl)-2,1,3-benzothiadiazole] (PFBTDBT10), which is a fluorescent polymer that allows for in vivo detection of the nanoparticles. Concentrations of silver or polymer nanoparticles were stimulate with 800 nm light and the temperature increases were measured. Cytotoxicity assays were then done to evaluate the effect of the nanoparticles on breast cancer cells: Eo771, 4T1, and E0771-Br5 (a brain trophic variant). Photothermal ablation assays in 2D or 3D were then performed to determine the concentrations of nanoparticles needed to induce cell death. Then 4T1 mammary fat pad tumors were induced in Balb/c mice. Only the polymer nanoparticles were delivered systemically and then the animals were imaged to examine the overlap of the fluorescence of the nanoparticles with the...