Assessment of Peripheral Nerve Regeneration Using Diffusion Tensor Imaging (DTI) in Reverse and Forward Autografts

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HYPOTHESIS: Diffusion tensor imaging (DTI) is magnetic resonance technology that is widely used in the study of the central nervous system and is emerging as a tool to non-invasively image peripheral nerves and assess the extent of nerve fiber regeneration. Given no definite consensus on the accepted autograft orientation during peripheral nerve injury repair, we compare outcomes between reverse and normally oriented (forward) autografts utilizing DTI.

METHODS: Thirty-six female Sprague Dawley rats were divided into 3 groups: 1) Control- left sciatic nerve isolation without injury, 2) Reverse Autograft- 10mm cut left sciatic nerve segment reoriented 180° and used to coapt the proximal and distal ends, or 3) Forward Autograft- 10mm cut nerve segment kept in its normal orientation for coaptation. Animals underwent Sciatic Function Index (SFI) and Foot Fault (FF) behavior studies at 72 hours, and then weekly. At 6 weeks, axons proximal, within, and distal to the autograft were evaluated using DTI and choline acetyltransferase motor staining for immunohistochemistry (IHC). Bilateral gastrocnemius/soleus muscle weights were compared to obtain a net wet weight to assess the degree of muscle atrophy. Statistical significance was determined using Mann-Whitney U test.

RESULTS: DTI findings including fractional anisotropy (FA), radial diffusivity, and axial diffusivity were similar between reverse and forward autografts at all nerve segments. There was no statistically significant difference in median motor axon counts proximal/within/distal between reverse and forward autografts (1519/561/362 vs 1516/490/338, p=ns). Likewise, there was no difference in behavioral studies (SFI, FF) at any tested time point, or net muscle weight (1.37g vs 1.33g) at 6 weeks.

CONCLUSION: DTI proves to be a reliable tool to assess peripheral nerve regeneration. It supports that reversing nerve autograft polarity does not influence outcomes.

Autograft repairs should therefore be oriented in the direction that allows the best fascicular alignment.

DISCLOSURES/FINANCIAL SUPPORT: None of the authors have a financial interest relevant to this abstract.

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Bilateral Breast Implant Rupture Following Elective Electrical Cardioversion: A Case Report and Review

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We present the case of a patient that suffered bilateral breast implant rupture following elective electrical cardioversion for atrial fibrillation. In general, breast implant rupture is extraordinarily rare. Capsular formation with dense muscular attachments, however, is common. Sudden and massive muscular contraction, as occurs during electrical cardioversion, can cause rupture of breast implants with significant health and cosmetic consequences. The incidence of this complication will certainly increase as the population of patients with breast implants and concomitant atrial fibrillation increases. Thus, particular caution is warranted among this patient population.

CASE REPORT: An 87-year-old female with a history of breast augmentation some 30 years ago presented to the out-patient office of a plastic surgeon complaining of pain, anatomic distortion and purple discoloration of her breasts. She related that she had undergone elective electrical cardioversion for new-onset atrial fibrillation immediately prior to symptom presentation. On physical exam the patient demonstrated severe bilateral capsular contracture with gross deformity of both breasts. Due to the extended time since the prostheses were placed surgical records were unavailable however she had what appeared to be implants placed in the subglandular position. There appeared to be
gros distortion of the shape and size of the implant as well as asymmetrical positioning of the nipple areolar complex on the breast mound. There was also frank blue-purple discoloration of both breasts. Work-up included magnetic resonance imaging with T1, short tau inversion recovery (STIR), and T2 sequences, which confirmed bilateral intracapsular implant rupture with diffuse hematoma and concern for extravasation of silicone material.

The patient was subsequently taken to the operating room for a planned two-stage procedure. The first procedure involved bilateral debridement of chest wall hematomas, removal of the silicone gel implants and complete capsulectomy. Upon exploration a dense fibrous capsule was encountered surrounding both implants, which firmly adhered the devices to the underlying muscle tissue, as well as gross contamination of the wound with free silicone gel. Explantation and examination of the prosthetic devices demonstrated course tears in the outer membrane with direct communication and seepage of silicone gel.

Reconstruction was carried out in a second procedure several months later without complication.

DISCUSSION: Capsule formation appears to be a normal physiologic response to the foreign body.

Though the exact mechanism of capsular formation is unknown, histologic studies have demonstrated that inflammatory cells quickly engulf the implant soon after implantation. Macrophages predominate in this response secrete substances that promote chemoattraction and proliferation of fibroblasts. These fibroblasts then produce collagen, which encases the breast implant in a dense fibrous capsule. Capsular contraction occurs when the capsule tightens and squeezes the implant, resulting in pain and deformity of the surrounding tissues. This is widely considered the most serious side effect associated with breast implants and one of the most predominant reasons for reoperation. The incidence of capsular contracture reported in the literature varies anywhere from 3–5% to as much as 17%. Complications of capsule formation include pain and tenderness, tissue deformity and other pathologic problems. Several factors have been shown to decrease the incidence of capsular contracture. A meta-analysis performed in 2013 by Steven et al. identified the two most significant contributing factors to capsular contraction was position of prosthetic placement and texture of the prosthesis itself. Submuscular versus subglandular placement of the breast prosthesis has been shown to decrease the incidence of capsular contraction by over 50%. Textured versus smooth implants have also been of the implant also has a significant impact on decreasing the rate of contracture.

Other factors leading to decreased contracture include mammammary incisions and larger breast implants. In the case we presented here, dense capsular formation and subclinical contraction only became evident following elective electrical cardioversion for new-onset atrial fibrillation. The most logical explanation is that the sudden and massive muscular contraction associated with the cardioversion created sufficient traction forces on the implant capsule to shear the outer membrane and permit extravasation of silicone gel into the surrounding tissue. This appears to represent the first reported incidence of breast implant rupture following electrical cardioversion. In terms of broad clinical relevance, this case demonstrates that in patients with a history of breast implant placement, consideration must be given to the potential for capsular formation and possible unintended consequences related to medical and surgical therapies. In this particular case, the complication may have been avoided by electing for chemical versus electrical cardioversion. Alternatively, deep sedation with the assistance of anesthesia may have allowed for electrical cardioversion without the typical intense muscular contraction. This case has broader implications as well, such as the potential contraindication of breast implants in patients with severe or refractory seizure disorders. To our knowledge this topic has not been explored to date and no reported incidents of this have been reported. However, given the similar etiology of these conditions, caution may be warranted in implanting these devices in this patient population.

CONCLUSION: Capsular formation following breast prosthesis implantation is a common occurrence. Capsular contraction remains a dreaded complication of breast augmentation and reconstruction surgery. Modifications to implant structure and composition as well as surgical technique and post-operative care have reduced the frequency of this complication though it remains a significant problem. Knowledge of this potential complication and consideration when planning medical and surgical therapies is recommended to avoid similar issues of morbidity in the future.

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**Botulinum Toxin A Injections for Treatment of the Facial Muscle Contractures Due to Guillain-Barré Syndrome: A Case Report**

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**INTRODUCTION:** Bifacial weakness with paresthesia is a rare subtype of Guillain-Barré syndrome (GBS). Generally, facial paralysis is transient and may recover completely with proper treatment. We describe a case of facial muscle contracture with synkinetic movement, resulting from GBS. Botulinum toxin A was effective to control these sequelae.

**CASE PRESENTATION:** A 29-years-old female was referred to us with a bilateral facial muscle contracture at rest and synkinetic movement after treatment of GBS. The contracture was seen in the whole face including the forehead, glabella, eye, cheek, upper lip, and mentum region.

Botulinum toxin A was used to suppress the facial muscle contractures and control the synkinetic facial movement. Although complete recovery could not achieved, the injection was effective. Now the patient has been undergoing the injections repeatedly with no adverse effect.

**CONCLUSION:** Facial muscle contracture due to GBS is well controlled by botulinum toxin A injections. However according to recovering of the facial functions, it is insufficient to treat only by botulinum toxin A injections.

**DISCLOSURE/FINANCIAL SUPPORT:** None of the authors has a financial interest in any of the products, devices, or drugs mentioned in this manuscript.

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**Breast Asymmetry in Women Requesting Plastic Surgery of the Breast**

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**INTRODUCTION:** It has been reported that 88% of women who had breast augmentation surgery had preoperative breast asymmetry. However, the prevalence of breast asymmetry has not been well studied in women undergoing other types of breast surgeries.

**METHOD:** Breast measurements of women, who did not have prior breast surgery, were prospectively recorded in a plastic surgery database. The women in the study had been consecutively evaluated for possible plastic surgery of the breast area. They were classified into three groups according to the presenting breast problem; hypoplastic breasts, macromastia, and ptotic breasts. Comparisons were made between the right and left side of each patient, regarding symmetry of the nipple-areola complex (size and position), breast mound, and chest wall. Differences between groups were evaluated using the Chi2 test and values of p<0.05 were considered statistically significant.

**RESULTS:** The breast measurements of 244 women who were consecutively evaluated were analyzed. The mean age was 34 ± 11 years. The study population was distributed in the following manner: 106 women had hypoplastic breasts, 80 women had macromastia, and 58 women had ptotic breasts. Asymmetry of the size and position of the nipple-areola complex was the most common type, being present in 54 ± 12% of women with hypoplastic breasts, 59 ± 15% of women with macromastia and 51 ± 10% of women with ptotic breasts. Asymmetry of the mound was found in 45 ± 12% (hypoplasia), 47 ± 10 (macromastia) and 43 ± 11% (ptosis) of the groups. Asymmetry of the chest wall was present in 12 ± 10% (hypoplasia), 11 ± 9 (macromastia) and 10 ± 7% (ptosis) of the groups respectively. Overall, we