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PURPOSE: To quantify departmental resources available to female plastic surgeons and identify remaining barriers to advancement for women in academic plastic surgery.

METHODS: Academic plastic surgery departments were identified and a female faculty member or male program director was selected. Representatives were surveyed on their department’s resources for promoting women leaders. An optional follow-up interview discussed current barriers to women seeking leadership positions.

RESULTS: 49 of 93 survey recipients participated (52.7\% response rate). Departments on average provided 2.69 of 11 resources (Table 1). Departments with female chairs provided 4.30 resources vs. 2.26 resources at departments with male chairs (p=0.014). Departments with female program directors provided 4.45 resources vs. 2.22 resources at departments with male program directors (p=0.006). Of the 49 survey respondents, 9 completed the interview (18.4\% completion rate). The most frequently identified barriers to aspiring women leaders (Table 2) were opaque promotion criteria (cited by 66.7\% of interviewees), compensation disparities (55.6\%), faculty homogeneity (55.6\%), and motherhood bias (55.6\%).

CONCLUSIONS: The presence of a female chair or program director is associated with a greater quantity of resources for promoting female leaders. Remaining barriers to women ascending to academic leadership include compensation and promotion disparities, faculty homogeneity, and motherhood bias.

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Real-time Dextrous Fine Motor Control of an Advanced Prosthetic Arm Using Regenerative Peripheral Nerve Signals

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PURPOSE: Peripheral nerves provide a promising source for neuroprosthetic control given that they are functionally selective and easy to access. However, current interface methods, such as penetrating electrodes, are limited either by low signal amplitude or interface instability. In contrast, Regenerative Peripheral Nerve Interfaces (RPNIs) are constructed by suturing a graft of devascularized, denervated muscle to the residual end of a severed nerve. The graft then regenerates, revascularizes, and is reinnervated by the nerve, creating a stable bioamplifier that produces high amplitude electromyography (EMG) signals. In addition, nerves can be surgically divided into fascicles to construct multiple independent RPNIs. Here, we demonstrate the extraction of hand level prosthetic control signals from RPNIs. We also demonstrate for the first time control of the DEKA Luke Prosthetic Arm from RPNIs with indwelling wires.

METHODS: We implanted RPNIs in two individuals with upper limb amputations. P1 had a proximal transradial amputation and underwent implantation of 9 RPNIs implanted, with the median, ulnar, and radial nerves subdivided into four, three, and two branches, respectively. P2 had a distal transradial amputation and was implanted with a single graft on each of the median, ulnar, and radial nerves (3 total RPNIs). During acute recording sessions, we used ultrasound to locate and visualize RPNI motor contractions, and implant percutaneous fine-wire bipolar electrodes into each RPNI. P1 was subsequently implanted with 8 indwelling electrodes from Synapse Biomedical (IDE #:G160229).

RESULTS: P1’s ulnar RPNIs produced signals with an average maximum voluntary contraction (MVC) of 211\textmu V and signal-to-noise ratio (SNR) of 3.48. P2’s ulnar RPNI produced EMG signals with an average MVC of 49.2\textmu V and SNR 7.45. Likewise, the median RPNI produced signals with an average MVC of 145\textmu V and SNR 16.8. Using a combination of RPNI and available residual muscle signals, subjects successfully controlled a virtual prosthesis in real-time. P1 could hit targets with a virtual small finger using a position/velocity Kalman filter with 98.2\% accuracy over 56 trials. Similarly, P2 could hit targets with a virtual thumb with 80.6\% accuracy over 108 trials. All decoders used temporal features of the EMG waveform within 300-1500Hz and binned at 50ms. Implanted electrodes in P1 enabled real-time control of the DEKA Luke prosthetic arm.
CONCLUSION: Overall, we have demonstrated that RPNIs produce motor specific contractions and high amplitude signals. Implanted electrodes enable an amputee to control numerous independent degrees of freedom in real-time with an advanced prosthetic arm.

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Immediate Reconstruction of Oncologic Spinal Wounds Is Cost Effective Compared to Conventional Primary Wound Closure

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PURPOSE: Several studies have demonstrated a reduced wound complication rate when immediate soft tissue reconstruction is performed at the time of oncologic spine surgery. Most authors document the use of bilateral paraspinous muscle flaps in this clinical scenario, demonstrating good outcomes. Despite the clear clinical advantages, the cost-effectiveness of this technique is not known. We hypothesized that immediate reconstruction of oncologic spine wounds using bilateral paraspinous muscle flaps would be a cost-effective strategy compared to the standard of care (oncologic spine surgery with conventional primary wound closure).

METHODS: We employed a decision tree model to evaluate the cost-utility, from the perspective of a hospital/insurer, of immediate reconstruction with bilateral paraspinous muscle flaps relative to primary incision closure after oncologic spine surgery. A systematic review of the literature on oncologic spine surgery and immediate and delayed spinal wound reconstruction was performed to estimate health state probabilities. Costs were estimated using 2014 Center for Medicare and Medicaid Services data for relevant associated CPT and DRG codes. Overall expected cost and quality-adjusted life years (QALYs) were assessed using a Monte Carlo simulation and sensitivity analyses.

RESULTS: Bilateral paraspinous muscle flaps performed in conjunction with oncologic spine surgery had an expected cost of $81,458.90 and an expected average QALY of 24.19, whereas primary wound closure (no reconstruction) had an expected cost of $83,434.34 and an expected average QALY of 24.17, making immediate soft tissue reconstruction the dominant, most cost-effective strategy. Monte Carlo sensitivity analysis demonstrated that immediate soft tissue reconstruction was the preferred and most cost-effective option in a statistically significantly greater number of iterations (81.3 percent vs. 18.7%; p<0.001), supporting its overall greater cost-utility. Even when the willingness-to-pay threshold varied from $0 to $100,000 per QALY, immediate soft tissue reconstruction remained the dominant strategy across all iterations.

CONCLUSION: This cost-utility analysis suggests that performing bilateral paraspinous muscle flaps in conjunction with oncologic spine surgery is more cost-effective than primary spine incision closure alone.

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Two-Stage Prosthetic Prepectoral Breast Reconstruction: A Comparison of Tissue Expansion with Carbon Dioxide and Saline

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PURPOSE: The AeroForm tissue expander is a carbon dioxide-filled breast tissue expander that allows gradual, needle-free expansion using a hand-held remote controller. This study evaluates two-stage, prepectoral tissue expander-to-implant breast reconstruction with the carbon-dioxide tissue expanders and compares the outcomes to our recent experience with saline tissue expanders.

METHODS: This was a retrospective study of consecutive patients from a single institution. The subjects consisted of women who underwent mastectomy and either immediate or delayed breast reconstruction with AeroForm or saline tissue expanders. Outcomes encompassed postoperative complications including mastectomy flap necrosis, infection requiring readmission and/or intravenous antibiotics, capsular contracture, hematoma, seroma, skin dehiscence, evis- sion, premature explant, and loss of communication with the device (AeroForm) or rupture of the device (saline).