Anatomical Considerations for Breast Neurotization

Ivica Ducic, MD, PhD1,2 and Erick DeVinney2

1,2 Washington Nerve Institute, McLean, VA, 2 AxoGen Corporation, Alachua, FL

Introduction
Autologous breast reconstruction following mastectomy restores the size, shape and symmetry of the breast. Over past few decades, with advancements in technical details, success and overall patient outcomes, microsurgical breast reconstruction became the standard and safe reconstructive choice to women with breast cancer. Yet the reconstructed breast lacks meaningful sensation since the reconstructed flap is denervated. Recent evidence based data suggests that breast neurotization is justified and offers faster innervation and better quality, more normal breast sensibility. However, standardization of neurotization techniques is lacking as the current literature reports a wide range of technical approaches.

Methods
Breast neurotization related literature and available technical approaches were reviewed. Cadaveric dissections were done to define optimal donor / recipient intercostal nerves (ICN) for DIEP breast reconstruction.

Objective
To define optimal donor and recipient nerves for the neurotization of DIEP flaps and to identify a reliable and reproducible method for their preparation.

Results
- Sensory recovery in innervated breast flaps better than non-innervated flaps
- Dual innervation more powerful in restoring sensation than single neurotization
- Patient QOL and satisfaction significantly better in those with neurotized then non-innervated flaps
- Sensory recovery of reconstructed nerves with processed human nerve grafts (Avance) are comparable/favorable to autografts outcomes for >2.5 cm nerve injuries

Conclusions
Breast neurotization aims to improve quality of life to post-mastectomy women with DIEP breast reconstruction. We present reliable and reproducible anatomical preparation of donor and recipient nerves. In addition, use of human nerve allograft for gap reconstruction is suggested to help overcome the nerve gap length, flap arc of rotation, and potential rectus denervation related hernia issues that can occur with other techniques. Clinical studies are underway to objectively validate the suggested technique, and thereby help standardize discussed surgical advancements.