# Anatomical Considerations for Breast Neurotization

**Ivica Ducic, MD, PhD[1,2] and Erick DeVinney[2]**

[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.

## Objective

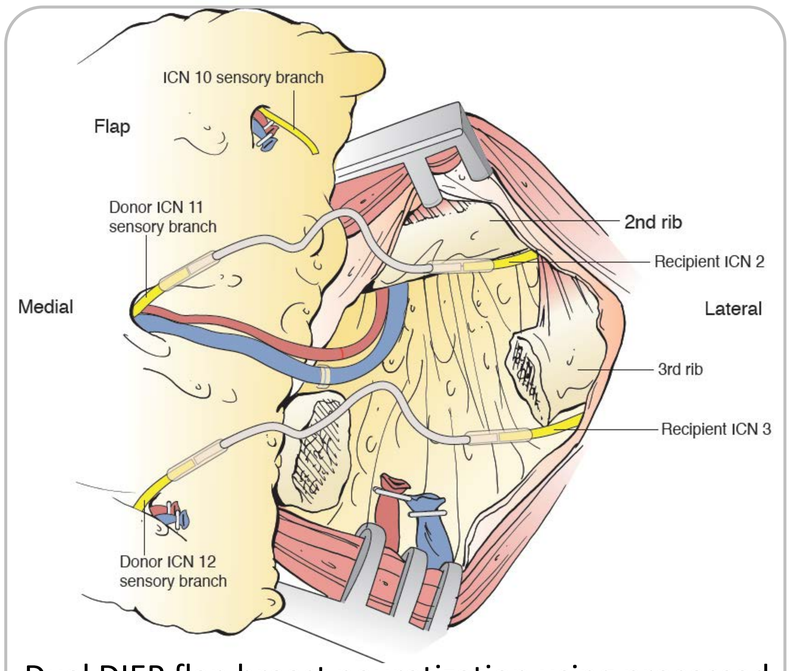
To define optimal donor and recipient nerves for the neurotization of DIEP flaps and to identify a reliable and reproducible method for their preparation.

## 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.

## Results

- Sensory recovery in innervated breast flaps better then non-innervated flaps
- Dual innervation more powerful in restoring sensation then 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




Dual DIEP flap breast neurotization using processed human nerve graft (Avance) to bridge the acquired nerve gap, facilitated by connector-assisted coaptation:

- ICN-12 (Donor#1) to ICN-3 (Recipient#1)
- ICN-11 (Donor#2) to ICN-2 (Recepient#2)

## Results

- Currently available data suggest limited breast neurotization options for bridging approximately 4-7 cm nerve gap as this is not possible by primary repair; is out of the range for conduits while autograft suggests extended dissection and morbidity risks.
- Per cadaver and clinical approaches, ICN 11 and 12 were easily and reproducibly identified with the harvested DIEP flap and can serve as the donor nerves.
- ICN 3 and 2 were routinely found along the inferior side of the ribs crossing recipient vessels and can serve as recipient nerves.
- Data on processed human nerve allograft (Avance®, AxoGen, FL) suggest comparable outcomes for up to 7cm autografts with a wide range of nerve reconstructions.
- Technique: After vascular anastomosis is complete, a 1.5mm x 70mm human nerve allograft serves as the interposing graft between donor and recipient nerves to allow tension free nerve reconstruction, eliminating the gap length and arc of rotation limitations of other techniques..

## 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.