Journal of Plastic, Reconstructive & Aesthetic Surgery (2018) 71, 327–335

JPRAS
An International Journal of Surgical Reconstruction
www.JPRASurg.com

Comparing the sensation of common donor site regions for autologous breast reconstruction to that of a healthy breast

Anouk J.M. Cornelissen [a], Jop Beugels [a], Arno Lataster [b], Esther M. Heuts [c], Shai M. Rozen [d], Aldona J. Spiegel [e], René R.W.J. van der Hulst [a], Stefania M.H. Tuinder [a,*]

[a] *Department of Plastic and Reconstructive Surgery, Maastricht University Medical Center +, P. Debyelaan 25, 6229 HX Maastricht, The Netherlands*
[b] *Department of Anatomy and Embryology, Maastricht University, Universiteitssingel 50, 6229 ER Maastricht. The Netherlands*
[c] *Department of Surgery, Maastricht University Medical Center +, P. Debyelaan 25, 6229 HX Maastricht. The Netherlands*
[d] *Department of Plastic and Reconstructive Surgery, University of Texas Southwestern Medical Center, 5323 Harry Hines Blvd, Dallas, TX 75390, USA*
[e] *Division of Plastic Surgery, Houston Methodist Hospital, 6565 Fannin St, Houston, TX 77030, USA*

Received 17 May 2017; accepted 12 September 2017

KEYWORDS
Breast reconstruction;
Microsurgery;
Nerve coaptation;
Innervation;
Sensation;
Donor site

Summary *Introduction:* Autologous breast reconstruction has become the standard care for breast cancer patients. Although excellent cosmetic results can be achieved, most reconstructed breasts fail to regain normal sensation. Nerve coaptation of the flap has been suggested to improve sensation; the effect of the donor flap native sensory threshold on the degree of sensory restoration is yet to be determined. The aim of this study is to evaluate the differences in sensation between various potential donor site regions in comparison to the sensation of the healthy breast.

Patients and methods: A cross-sectional study in healthy women was performed in the Maastricht University Medical Centre. Monofilaments were used to measure sensation in the breast and at different flap donor sites: deep inferior epigastric perforator (DIEP), lateral thigh perforator (LTP), profunda artery perforator (PAP), superior gluteal artery perforator (SGAP) and transverse musculocutaneous gracilis (TMG) flaps. The Wilcoxon signed rank test was used to analyse statistical significance in sensation.

Presented at: EURAPS research counsil 2017 Pisa Italy, 24 May 2017; WSRM2017 Seoul Korea, 16 June 2017.
* Corresponding author. P. Debyelaan 25, 6229 HX Maastricht. The Netherlands.
E-mail address: s.tuinder@mumc.nl (S.M.H. Tuinder).

https://doi.org/10.1016/j.bjps.2017.09.011

Results: Fifty women with a mean age of 49 ± 2.72 years and mean BMI of 26.14 ± 0.89 kg/m^2 were included in the study. The median monofilament value of the normal breasts was 2.97(2.56–3.55). The median monofilament value of each donor site and *p* value when compared to the healthy breast were as follows: DIEP flap, 2.62 (2.36–3.22) $p < 0.01$; LTP flap, 3.61 (2.83–4.08) $p < 0.01$; PAP flap, 3.09 (2.67–3.5) $p = 0.97$; SGAP flap, 3.22 (2.64–3.87) $p = 0.01$; and TMG flap, 3.03 (2.6–3.47) $p = 0.69$.

Conclusions: There is a significant difference in sensation between the various donor site regions for breast reconstruction and the healthy breast. This may be taken into consideration for donor site selection.

Introduction

Autologous breast reconstruction has become part of the standard care in breast cancer treatment. Reconstruction techniques have evolved and improved over time, in particular with the introduction of perforator flaps.[1] Refinement of surgical techniques have resulted in reduction of donor site morbidity[2–4] and a more natural and aesthetic appearance of the reconstructed breast; however, most reconstructed breasts fail to regain normal sensation. Moreover, some studies report a better sensory recovery of the reconstructed breast with nerve coaptation between a sensory nerve at the donor site and a sensory nerve at the recipient site,[5–9] and despite reports that sensation in a reconstructed breast has a positive effect on the quality of life,[9] in addition to providing protective sensation against thermal and mechanical injuries,[10,11] this topic remains under-investigated.

Several donor sites for autologous breast reconstruction have been described. Besides the deep inferior epigastric perforator (DIEP),[12–14] lateral thigh perforator (LTP),[15,16] profunda artery perforator (PAP),[17,18] transverse musculocutaneous gracilis (TMG)[19,20] and superior gluteal artery perforator (SGAP) flaps[12,13] have been used. Nowadays, the DIEP flap is considered the first choice in autologous breast reconstruction. However, the donor site selection depends on several factors such as patient's shape, previous scars, imaging of the vessels, pedicle length, postoperative complications and patient's wish. Moreover, preoperative sensation in the donor site area might be an additional factor to consider. The preoperative sensation of the potential donor sites could be an indication for the level of sensation, which can be achieved after autologous breast reconstruction with nerve coaptation using that specific donor site.

The aim of this study is to evaluate the sensation of the skin island of the donor site regions for breast reconstruction and compare them to the sensation of a healthy, non-operated breast.

Patients and methods

In the Maastricht University Medical Centre, a cross-sectional study was performed on healthy female adults with no history of an operation, scars or distinctive markings (e.g. birth marks or tattoos) in the areas to be measured. In addition, known neurological conditions that could affect sensation, such as diabetes and neuropathy after chemotherapy, were considered exclusion criteria. The study was conducted according to the STROBE guidelines and the world medical association declaration of Helsinki (2013).[21] Ethical approval was obtained from the Medical Ethical Committee (METC) of Maastricht University.

Participants were recruited between September and October 2016; written informed consent was obtained. A suitable sample size could not be calculated because no previous data were available. Fifty participants were included. Demographic data were collected by asking participants about their age, length, weight and cup size. Sensation of the breasts and different donor sites of the DIEP, LTP, PAP, SGAP and TMG flap were measured on one side of the body in each participant.

Semmes-Weinstein monofilaments were used for sensation measurement.[22] A new 20-piece kit of the Semmes-Weinstein monofilaments was obtained for the start of this study. Each monofilament value represents the logarithm of the force in milligrams required to bend the monofilament. Therefore, a thinner monofilament requires less pressure to bend and, if felt by the patient, represents improved one-point static discrimination. As inter-examiner variability can diminish specificity and sensitivity, measurements were performed by one researcher according to the guidelines to mitigate this effect.[23] Perpendicular pressure was applied to the same spot until monofilament bending was noted each time for a duration of 1.5 s, three times in succession, with intervals of 1.5 s. The researcher measured time intervals by saying '21', which equals to about 1 to 1.5 s. Testing started with the thinnest monofilament and progressed to monofilaments of increasing pressure until touch was identified in at least one out of three times by the participant. The participants had their eyes closed and measurements took place in a quiet room. The different sites were tested in a random sequence to ensure participants could not predict touch at a particular site.[24] The areas to be measured were predefined by anatomical references and will be discussed below. The participants were tested either seated (breast) or standing upright (abdomen and leg).

Breast

Nine areas were tested in each breast (Figure 1). The breasts were divided into 4 quadrants by 2 lines: a vertical line was drawn from mid-clavicle to the nipple and a horizontal line was drawn perpendicular to the first line at