Nipple and areolar reconstruction with tattoo pigments, grafts and local flaps

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In order to obtain symmetry when reconstructing the nipple and areola, the breast mounds are worked on first. Having reconstructed one side, the volume and shape of the opposite breast is modified as needed; then the areola can best be imitated on the reconstructed breast by placing tattoo pigments on the dermis of a thin skin graft. If the areola that is to be matched is light in colour, it is preferable to tattoo the skin directly. This is done as the initial procedure, as an improvement or as 'maintenance' to an already tattooed areola. The nipple reconstructed by grafting part of the opposite nipple or section of areola produces the most natural-looking results. Another method involves lifting a tulip-shaped, centrally based dermis flap and then covering the areola and this flap with a thin skin graft with tattoo pigments smeared on its dermis. A nipple is made of the breast skin when the mound is revised by taking a segment off its lower quadrants.

Key Words: Breast reconstruction, Mastectomy and reconstruction, Nipple and areolar reconstruction

Reconstruction du mamelon et de l'aréole avec tatouage, greffes et lambeaux
RÉSUMÉ: Pour obtenir une symétrie lors de la reconstruction du mamelon et de l'aréole, la glande mammaire est remodelée d'abord. Après reconstruction d'un côté, le volume et la forme de l'autre sein sont appariés, puis l'aréole peut être imitée en disposant les pigments de tatouage sur la peau de la greffe. Si l'aréole qui doit être assortie est de couleur pâle, il est préférable de tatouer directement la peau. Il s'agit de la première étape de l'amélioration ou du «maintien» d'une aréole déjà tatouée. C'est le mamelon reconstruit à partir d'une greffe partielle du mamelon ou d'une section de l'aréole du sein opposé qui donne l'aspect le plus naturel. Une autre méthode consiste à soulever un lambeau en forme de tulipe à la base du derme central et à recouvrir l'aréole et ce lambeau avec un greffon de peau dont le derme est tatoué au préalable. Un mamelon est construit à partir de la peau du sein lorsque la glande a été remodelée, à partir d'un segment prélevé aux quadrants inférieurs.

TATTOOING DIRECTLY ON THE SKIN SURFACE

Indications
Tattooing directly on the skin surface (1-7) is most useful for imitating an areola with a soft transition on the perimeter and with a smooth surface (Figure 1). I also use it to improve previously reconstructed nipples that have the white scar 'target' appearance, to camouflage the areola perimeter scars and for general 'maintenance' on areolas that have depigmented with time. Tattooing the opposite nipple and areola with the same pigments as the reconstructed one is useful for achieving symmetry.

Instruments
There are two basic types of machines used to drive the tattooing needles up and down. One is the electromagnet type that moves a shaft by drawing two contact points. The other is the mechanical type of a camshaft that is driven by an electric motor or by pneumatic power. There are many models of these instruments on the market, available either from 'medical' suppliers or from the less expensive and just as effective outfitters for the professional tattoo artists (eg, Spaulding & Rogers Mfg Inc, Voorheesville, New York).

I have tried many different machines and found that a pneumatic reciprocating saw with a chuck fitted with a six needle flat shader is a very effective tool. This type of saw is usually available in the operating rooms of nearly every hospital in either the plastic surgery or the orthopedic departments. I use a tattoo machine purchased from the professional tattoo artists who also carry the entire line of 'skin shades' pigments.

Tattoo pigments
The pigments used for imitating natural skin colour are inorganic substances also called 'earths'. The brown colour contains brown iron oxide and titanium dioxide, dissolved in a mixture of glycerin, alcohol and water.

Tattooing technique
The tattooing technique provides a way of permanent body painting, with the intention of creating an aesthetic symmetry. Pigments must be placed so as to copy the opposite areola in its symmetrical location, colour tones, shades and, if possible, its surface variations.

The markings of the position and dimensions should be made with the patient in an upright position marking the
Figure 1) (Left) Before and three years after a lower abdominal transverse rectus abdominis miocutaneous (LATRAM) reconstruction. (Above) The areola was created by tattooing on the skin surface; the nipple was made by sharing with the opposite, cutting it transversely across perimeter of the areola. The model areola that has not been operated upon is seldom perfectly round, so I copy its contour by taking the maximum and minimum diameters, then marking a roundish shape as a mirror image on the reconstructed breast. Consideration should be given to the fact that a reconstructed mound with a rectus abdominis miocutaneous (RAM) flap tends to drop 1 or 2 cm in the first year after the reconstruction and the nipple of a reduced breast occasionally tends to rise from the initial surgical markings. There can also be quite a variation in the areola between its contracted and relaxed state, so allowances for these changes are made during these markings.

Once the area to be tattooed is outlined, I coat it with sterile petrolatum gel and start mixing the tattoo pigments. To obtain a shading effect I mix three colours; beige (also called ‘tan’ or ‘flesh’ by different manufacturers) (8), light brown and a very small amount of red (commonly found around the nipple in Caucasians). Black is used only in small amounts in people with very dark skin. These pigments can be placed directly over the skin or into the receptacle located in the tube that encases the needle shaft. The darker colours are placed in the centre, getting lighter towards the perimeter. It is important to hold the breast skin quite taught as the needles are applied. The edges of these should be held parallel to the surface of the skin, ensuring one corner of the ‘comb’ of needles does not penetrate deeper than the other, to avoid causing undesired lacerations. One should also avoid ‘over-working’ an area (passing the needles several times over the same area). This can create a deeper abrasion that tends to bleed and scab with consequent pigment loss. The needles
Technique

The donor area of a skin graft will be tender for several days and may be a source of complications. Therefore, whenever possible, I take the skin graft from the discarded skin of the reduced breast. After doing the standard markings for a breast reduction with the patient in the upright position, and marking the new nipple placement on the reconstructed breast, the graft is removed with a power dermatome. This dermatome cuts through the dermis very evenly without leaving the stroke marks that show up as definite lines when we use a manual dermatome. The removed graft should be thin and translucent enough to permit the pigments to show through it. This thin skin graft is placed dermis side upwards on an oily gauze and the selected shade of pigments are smeared on it. Care should be taken to wipe off any clumps of pigments with a dry gauze and then, if necessary, reapply darker tones until the best match is acquired, leaving no excess pigment that could hinder the take of the graft. A satisfactory cosmetic result is seen when darker pigments are placed towards the centre and comma shaped Montgomery glands are imitated (Figure 2). Then, after cutting a hole for the grafted nipple to come out, we place the graft on the de-epithelialized area, tailor its edges and immobilize it with paper strip tapes. A moulded oily gauze is then positioned and held in place with more paper strips for at least two weeks.

Evolution and comments

Since 1987, when I started using this technique, 158 areolas have been reconstructed this way. The results are very realistic and have improved as I learned more about mixing pigments to imitate the opposite areola. Complications or partial takes have been very rare, especially since I became careful to remove any pigment clumps. I have noted some degree of fading over the years but much less than the pigment loss that occurs when tattooing directly over the skin. Observing biopsies of areolas performed this way, the pigment can be seen lying in the fibrous interphase between the recipient dermis and the graft (Figure 3). Perhaps this relatively avascular location of the pigment may explain its longevity.

NIPPLE RECONSTRUCTION BY SHARING

Indications

Having reviewed a large number of cases, I have no doubt that the best looking nipples are made with composite grafts of the opposite nipple-areolar complex. Naturally, these are limited by patient refusal, absent donor tissue or for oncological reasons.

Techniques

Donor nipple divided transversally across: This technique (3,11-13) is used when there is a large remaining nipple; removing half of it not only gives an excellent reconstruction but also improves the looks of the donor. I use a #20 scalpel blade after having firmed the nipple with a skin hook and
divided it transversely through the middle. The stump is then closed with a purse-string of 6-0 reabsorbable suture material. Stitches of the same suture material are used to immobilize the graft to the dermis donor area avoiding any crushing of the graft. A moulded bolus dressing of oily medicated gauze is placed over it and left untouched for at least two weeks.

This technique is usually coupled with an areolar reconstruction with the pigmented skin graft so the bolus dressing will cover both.

**Donor nipple divided tangentially (3,7,14,15):** This is usually performed when the donor nipple has less than 1 cm of projection. I remove the tissue tangentially so the remaining nipple will not lose much height. Usually conducted in combination with a skin tattoo on the surrounding areola, the tattoo is made first, placing the darkest pigments on the centre of the areola. Then a 1 cm diameter U shaped incision is made on the centre of the tattooed area and lifted as a trap door flap from the deep dermal level. This has the great advantage of doubling the bleeding recipient surface which increases the take of the graft. Then a skin hook is placed on the edge of the donor nipple, and with a #20 blade, a composite graft is removed that includes half of the top of the nipple plus one side and part of the areola. This graft is then inserted into the previously tattooed trap door flap and carefully sutured with 6-0 reabsorbable material (Figure 4). The donor site is closed with mattress stitches located on the base of the nipple.

**Areolar edge as donor (3,12) (Figure 5):** I choose this donor site for nipple reconstruction when the donor areola is smooth and light coloured but not large enough for sharing half its area, and the breast needs a reduction which would leave a scar around the areola anyway. It is also used when the nipple has very little projection or the patient refuses to have it touched.

First, I mark the areolar diameter for the reduction mammoplasty; then a crescent strip along the outer remaining areola, about 2 to 3 cm long by 1 cm wide, is removed. This full thickness graft is folded in half and sutured to itself along the middle and to the de-epithelialized donor site with 6-0 reabsorbable suture material. I use the same dressing as previously mentioned, an oily medicated moulded gauze that also covers the areolar area, and immobilize it with paper tapes for at least two weeks.

**NIPPLE AND AREOlar RECONSTRUCTION WITH THE TUBULAR DERMIS FLAP AND A PIGMENTED SKIN GRAFT**

**Indications**

Bilateral breast reconstruction is the most common indication for the use of this technique (10). Symmetrical and well defined nipple-areolar complexes are the usual result. I also use it in patients who refuse to have the opposite nipple or areola operated on.
Figure 5) (Left) Before and four years after a LATRAM reconstruction; a breast reduction was carried out on the left breast. (Above) The areola was tattooed and the nipple was made by removing a rim from the opposite areola at the same time as the reduction, and setting it into a trap door flap.

Figure 6) Nipple and areola reconstruction with a tubular dermis flap and a pigmented skin graft. (Top left) Skin is held taut with one hand and, using a small dermatome, a very thin layer of skin is removed with the other hand. (Top right) A dermis-only flap is raised off the deep dermis, leaving it attached only to a central pedicle of about 1 cm in diameter. (Bottom left) The dermis-only flap is shaped into a tube by placing two purse-string stitches of 5-0 absorbable material. (Bottom centre) A thin 8 x 8 cm skin graft is spread out and its dermis side is smeared with tattoo pigments. Darker colours are placed in the centre and Montgomery glands can be imitated. Care is taken to remove any clump of pigment. (Bottom right) The dermal tube is now covered with the prepigmented skin graft, trimmed and a molded oily gauze is placed over it.

Figure 7) (Left) Before and five years after a breast reconstructed with a LATRAM flap, and a breast reduction with a free nipple graft on the left. (Above) Close-up of the nipple and areola reconstruction, using a full thickness graft by sharing half of the opposite. The graft on the reconstructed breast had partially depigmented, which is common, but coloration returned after two years.
Evolution and comments

This technique has produced very natural and lasting results, though the original colours tend to fade after several years. Also, the nipple projection seems to flatten and acquire a semi-spherical appearance which did not seem to bother any of the patients. So far 48 nipples/areolas have been constructed using this technique, including 17 patients with bilateral reconstruction. In eight cases a scab has formed with eventual loss of part of the nipple.

NIPPLE AND AREOLAR RECONSTRUCTION WITH FULL THICKNESS GRAFTS BY SHARING HALF OF THE OPPOSITE

Indications

This technique (3,15,16) is used when planning the opposite breast reduction which has a very large areola.

Technique

The simplest way of performing this technique involves halving the donor nipple-areolar complex and using each half as a free composite graft placed on the most prominent part of each breast. It is preferable to divide the nipple-areolar complex by drawing a large S or a conjoined spiral across the middle. An alternative approach, which is especially useful when doing a breast reduction with a parenchymal pedicle, is to use as a graft the outer perimeter of areola that is usually discarded. This full thickness areolar graft is cut into a long strip; then one end is folded onto itself to form the nipple and the rest is sutured around it in a snail or ‘jelly roll’ fashion. The bolus dressing is the same as previously described.

Evolution and comments

Though these full thickness grafts are time consuming and meticulous to perform, the final results are usually very gratifying and after years they look better than many of the previously described techniques. It is not uncommon for these grafts to initially undergo some discoloration with loss of pigment, especially in dark skinned people, but this tends to return in one or two years (Figure 7).

The scars inside the areola can be tattooed if too visible. I have used these full thickness grafts to reconstruct 63 nipple-areola complexes. There have been five cases of minor areas of skin loss, but no total nipple losses. The low incidence of tissue loss can be explained by the fact that the grafting was performed on well vascularized donor areas such RAM flaps or opposite reductions.

NIPPLE RECONSTRUCTION AS PART OF THE MOUND REVISION

Indications and technique

Breast mounds made with RAM flaps tend to have a rather flat surface that can be transformed into a more conical shape by removing a pie-shaped section of skin and fat from the lower quadrants. When doing this operation, I have reconstructed the nipple with a 1 x 2 cm skin flap left attached at the top of the excised skin wedge (Figure 8). Before the excision, I tattoo the area that will become the nipple flap, then I excise a diamond-shaped piece of skin and fat down to fascia with its widest point at the inframammary fold that will give the breast a cone shape. The small rectangular flap is folded on itself and sutured, forming a nipple. The wedge edges are sutured in two layers which will better define the inframammary fold, and finally the rest of the areola is tattooed. This technique forms very adequate nipples and at the same time improves the shape of the breast.

REFERENCES
8. Spaulding H. Tattooing A to Z – A guide to successful tattooing. ISBN 0929719-00-X.

CALENDAR OF EVENTS

SEPTEMBER 29 TO OCTOBER 2, 1993
48th annual meeting of the American Society for Surgery of the Hand
Kansas City, Missouri
Contact: SSH 3025 South Parker Road, Suite 65, Aurora, CO 80014, USA. Telephone (303) 755-4588.

OCTOBER 5-8, 1993
42nd national congress of the Italian Society of Plastic, Reconstructive, and Aesthetic Surgery
Lucca, Italy (Villa Mansi)
This program will consist of round table conferences and free papers on the orbit, alloplastic materials, the nose and burns.
Contact: A Morelli, Divisione di Chirurgia Plastica, Ospedale di Lucca USL, No 6, Italy. Telephone 0583-970465-6, Fax 0583-970464.

OCTOBER 15-16, 1993
20th annual meeting of the Canadian Society for Aesthetic (Cosmetic) Plastic Surgery
Montreal, Quebec
There will be a one day live surgery session and a one day scientific session.
Contact: Pat Hewitt, Canadian Society for Aesthetic (Cosmetic) Plastic Surgery, 4650 Highway No 7, Woodbridge, Ontario L4L 1S7. Telephone (416) 831-7750.

OCTOBER 22-23, 1993
Twenty-fifth annual cleft palate and craniofacial anomalies symposium
Santa Monica, California
Contact: Gail Drewniak, Coordinator, Cleft Palate Centre. Telephone (310) 829-8150.

OCTOBER 23-27, 1993
Bi-annual congress of the International Society of Cranio-Facial Surgery
Oaxaca, Mexico
Contact: Professor Daniel Marchac, 130, rue de la Pompe, 75116, Paris, France. Fax (1) 47 27 65 15.

OCTOBER 24-27, 1993
Sixth congress of the Asian Pacific Section of IPRS
Seoul, Korea
Contact: Dr Young-Ho Lee, Congress Secretary, 301 Chung-Un Bld. 9-12, Samsung-Dong, Kangnam-ku, Seoul, Korea. Telephone 739-2141, Fax 516-6171, Telex 29271, Ext 1177.

NOVEMBER 10-12, 1993
First PanHellenic congress of plastic, reconstructive, and aesthetic surgery
Athens, Greece
Contact: Dr J Ioannovich, President of the Congress, Hellenic Society of Plastic and Reconstructive Surgery, 32 Xenias Street, Zografou, Athens 157 71, Greece.

NOVEMBER 10-13, 1993
20th annual symposium on aesthetic and reconstructive surgery of the breast
Guadalajara, Jalisco, Mexico
An international faculty team will provide English-Spanish presentations, for which translations will be available.
Contact: Jose Guerrerosantos, Garibaldi 1793, Guadalajara, Jalisco, Mexico 44680.

NOVEMBER 13, 1993
American Society of Ophthalmic and Plastic and Reconstructive Surgery annual scientific symposium
Chicago, Illinois
Contact: ASOPRS Secretary of Meetings, Ralph Wasley, MD, Suite 216, The Atrium, 250 25th Avenue North, Nashville, TN 37203, USA. Telephone (615) 329-0639.

NOVEMBER 18-20, 1993
Rhinoplasty Course
New York, NY (Waldorf Astoria)
Contact: Francine Leinhardt, telephone (212) 838-9200.

NOVEMBER 26-27, 1993
20th annual meeting of the Japanese Society of Reconstructive Microsurgery
Nagoya, Japan
Contact: Shuhei Toru, President, Japanese Society of Reconstructive Microsurgery, Department of Plastic and Reconstructive Surgery, Nagoya University School of Medicine, 65 Tsuruma-Chou, Showa-Ku, Nagoya, 466 Japan. Telephone 52-741-2111, ext 2321.