

Original article

The transverse musculocutaneous gracilis free flap for breast reconstruction: experience with 6 cases

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Introduction: Microsurgical techniques have allowed reconstruction procedures after mastectomy to take a qualitative leap with the development of different technical options. Although the abdomen is the main donor area destined for breast reconstruction, occasionally this skin is not sufficient or unsuitable for this purpose. In these cases, alternative donor areas are required, such as the flap of the transverse myocutaneous gracilis (TMG) muscle. The objective of this study is to evaluate the reliability of the TMG flap and the level of patient satisfaction with the result obtained.

Material and methods: During a nine-month period in 2009, 72 breast reconstructions were performed, of which 17 required the use of free flaps. In 7 of these cases, the abdominal wall could not be used as a donor area; therefore 6 of them opted for the TMG flap. The surgical technique and its results have been analysed, as well as the patient satisfaction with the results obtained using a questionnaire.

Results: There was no total or partial loss of the flap or other complications at the transfer level. There was minor dehiscence in the donor area in 3 of the cases. The patients classified the results of the reconstruction as satisfactory or good.

Conclusions: The TMG flap is a good technical option, comparable to abdominal flaps, for patients with small or medium sized breasts which require reconstruction with autologous tissue. The evaluation of the results by the patients was satisfactory or good.

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Reconstrucción mamaria con colgajo miocutáneo transverso de gracilis libre: experiencia en 6 casos

R E S U M E N

Introducción: Las técnicas microquirúrgicas han permitido que los procedimientos reconstructivos tras la mastectomía hayan dado un salto cualitativo con el desarrollo de diferentes opciones técnicas. Aunque el abdomen constituye la principal zona donante utilizada para el diseño de colgajos destinados a la reconstrucción mamaria, en ocasiones, esta piel no es suficiente o no es adecuada para este fin. En estos casos, se requieren zonas donan-

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tes alternativas como el colgajo transverso del músculo gracilis (TMG). El objetivo de este estudio consiste en valorar la fiabilidad del colgajo TMG y el grado de satisfacción de las pacientes por el resultado obtenido.

Material y métodos: En el año 2009, durante un periodo de 9 meses, se realizaron 72 reconstrucciones mamarias de las que en 17 fue necesario usar colgajos libres. En 7 casos no se pudo utilizar la pared abdominal como zona donante, por lo que en 6 de ellos se optó por el colgajo TMG. Se han analizado la técnica quirúrgica y sus resultados, así como la satisfacción de las pacientes con el resultado obtenido mediante una encuesta.

Resultados: No se produjo ninguna pérdida, parcial o total, del colgajo ni hubo otras complicaciones a nivel de la transferencia. En la zona donante se produjeron dehiscencias menores en 3 de los casos. Las pacientes calificaron el resultado de la reconstrucción como satisfactorio o bueno.

Conclusiones: El colgajo TMG representa una buena opción técnica, equiparable a los colgajos abdominales, para pacientes con mamas de pequeño o moderado tamaño que precisan una reconstrucción con tejidos autólogos. La valoración de los resultados por las pacientes ha sido satisfactoria o buena.

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Introduction

Microsurgery is an indispensable technique without which our current concept of reconstructive breast surgery would not exist. In the 80's and 90's, the use of this technique allowed for optimising the already existing procedures for breast reconstruction surgery, such as the pedicled transverse rectus abdominis myocutaneous flap (TRAM). The new anatomical studies that have appeared, focused on septocutaneous and myocutaneous approaches, along with the subsequent development of perforator flaps and traditional, constitute a range of options that make up the current therapeutic arsenal for breast reconstruction using autologous tissue. The objective of these techniques is to reduce the morbidity of tissues in the donor area and to improve the final results of the reconstruction. Abdominal flaps provide the best results for breast reconstruction following a mastectomy. However, in some cases this type of flap is contraindicated, such as in patients that have previously undergone surgical procedures involving the abdominal wall, in which the deep epigastric vascular system may be damaged, or in patients with scarce excess abdominal cutaneous tissue. In these cases, we must use other tissue donor areas, such as the interior side of the thighs.

The aim of this study was to analyse the efficacy and safety of TMG flaps in our experience and to evaluate the level of patient satisfaction with the results obtained.

Material and method

During the first 9 months of 2009, we performed 72 breast reconstructions at our unit. In 38 cases, we opted for immediate reconstruction, using a breast tissue expander in 32 cases, placing a direct prosthesis in 5 cases, and a TMG flap in 1 case. The other cases were deferred reconstruction, in which 12 were resolved using an expander, 6 placing a prosthesis with a latissimus dorsi flap, and 16 using free

flaps: 10 deep inferior epigastric perforator (DIEP) flaps, 5 TMG flaps, and 1 superior gluteal artery perforator (SGAP) flap.

During this time, we performed 6 TMG flap transfers in 5 patients (one required two TMG flap transfers for bilateral mastectomy). In all cases except one, the patients were women that had undergone mastectomies for malignant tumours, requiring adjuvant radiation therapy. The remaining case was a female patient with recurrent mastitis in which the use of a prosthesis was ruled out due to the risk of infection. Given that the patients had undergone radiation therapy or had a history of chronic infection, we decided to use flap coverage exclusively using autologous tissue for breast reconstruction. The criteria for choosing TMG flaps was based on the inability to use abdominal skin for breast reconstruction, whether due to previous scarring of the abdominal wall or the lack of sufficient excess cutaneous abdominal tissue in order to close the defect caused to the donor area (Table 1).

Surgical technique

In each patient, a transverse myocutaneous gracilis flap was separated with a cutaneous island between 10-11 cm wide and 20-23 cm long in the internal side of the homolateral thigh, centred along the gracilis muscle (Figure 1).

The dissection of the cutaneous island commenced in the inguinal area of the patient lying in supine position with the hip slightly flexed and externally rotated. The gracilis muscle was outlined, which lies immediately posterior to the prominence of the adductor longus muscle of the internal side of the thigh. Once the medial edge of the adductor longus was reached, the muscular fascia was also dissected in order to preserve the trajectory of perforators located along the gracilis muscle. Lastly, the cutaneous dissection was extended in the direction of the gluteal fold, avoiding leaving any scars in the ischial support area.

The vascular pedicle of the gracilis muscle was identified roughly 10 cm below the pubis, along the branch of the obturator nerve that innervates it. We then continued the

Table 1 – Patient variables and inclusion criteria

	Age	Mastectomy type	Type of reconstruction	CT	RT	Inclusion criteria
Case 1	42	Bilateral	Differed	Yes	Yes	Insufficient excess cutaneous tissue
Case 2	53	Right	Differed	Yes	Yes	Previous scarring
Case 3	38	Right	Differed	Yes	Yes	Insufficient excess cutaneous tissue
Case 4	46	Right	Differed	Yes	Yes	Insufficient excess cutaneous tissue
Case 5	51	Subcutaneous left	Immediate	No	No	Previous scarring

CT indicates chemotherapy; RT, radiation therapy.

**Figure 1 – Outlined gracilis muscle with transverse cutaneous island.****Figure 2 – TMG flap. Note the vascular pedicle (white arrow) and central tissue from the gracilis muscle (black arrow).**

dissection of the pedicle below the adductor longus muscle, ligating all structures branching out from it. The final centimetres of the dissection cause some difficulty due to the reduced operating field, and so it is useful to continue the incision distally, accessing the deep femoral vein and artery in the medial position with regard to the adductor longus muscle, following the circumflex artery until reaching the already dissected portion.

Lastly, the distal and then proximal insertions of the gracilis muscle were dissected in order to avoid damage to the pedicle from muscle contractions resulting from the dissection, and checked to ensure good perfusion of the cutaneous flap before ligating the pedicle at its junction to the deep femoral vein and artery (Figure 2). Then, the internal mammary artery was approached in the space between the third and fourth costal arches. The third costal cartilage was occasionally extirpated in order to gain sufficient exposure of the vessels to allow for a proper anastomosis.

The flap is then applied by rotating it 180° so that the gracilis muscle gives volume to the upper pole of the breast. The skin paddle was sutured over itself with two or three sutures in order to give the reconstruction a conical, projecting shape (Figure 3).

During the hospital stay, we administered prophylactic doses of low molecular weight heparin and acetyl-salicylic acid (100 mg per day) for 30 days.

Evaluation of the results and level of patient satisfaction

We evaluated the efficacy and safety of this technique considering the survival of the transferred flap and the complications produced in both the reconstructed and donor areas of each patient. We asked each patient to evaluate the results of the surgical operation after 6 months using a questionnaire. This survey was simple, and asked each patient to score various aspects of the results using a scale



Figure 3 – TMG flap adapted to the thorax and sutured over itself to give a projected shape.

of 1 to 5, referring to the shape, volume, and quality of the tissue. 1 was a very bad result, similar to the preoperative condition, and 5 was a very good result, similar to never having undergone a mastectomy.

Results

The mean duration of the surgical procedure was 325 min, approximately 105 min of which were necessary for dissecting the flap, and the others for the anastomosis and adaptation of the flap to the thorax. The weight of the transferred tissue ranged between 340 and 400 g. Mean hospital stay was 7.5 days, with a range of 7-9 days. Survival of the transferred tissue was complete in all 6 cases. No major complications arose in

any of the patients, although in case 5 we did observe a 2 cm diameter area of indurated tissue in the reconstructed breast that corresponded to necrotic fatty tissue. We observed minor dehiscence of the scar in the donor area in 3 cases, which were healed by secondary intention within 4 weeks. Results were all evaluated as either good or satisfactory (Figure 4, Figure 5). The lowest evaluations given for the categories of volume and shape were due to slightly lower levels of fill achieved with the reconstructed breast as compared to the contralateral breast, or insufficient projection of the transferred flap. In the quality category, the lowest scores were due to the presence of excess pilosity in the reconstructed breast or slightly different skin pigmentation that stood out against the skin of the thorax (Table 2).

Discussion

Although free flaps are the last resort for breast reconstruction, the technical experience reached during its execution, as well as the quality of the results obtained, make this the first option in many cases when planning a breast reconstruction surgery. More simple procedures such as the use of expanders and prostheses may be rejected by potential patients due to the introduction of foreign materials into the body, which can cause complications, especially in patients that have received coadjuvant radiation therapy.^{1,2} Latissimus dorsi flaps do provide an option in irradiated patients, with good results produced in several different studies. However, the small volume provided obliges the use of a prosthesis as well, which can lead to complications derived from the implanted material such as capsular contracture, thus distorting short and long-term results.³ Abdominal flaps, such as the free TRAM and DIEP, are the best option for breast reconstruction with autologous tissue. The abdominal region provides



Figure 4 – Preoperative surgical area in case 1.

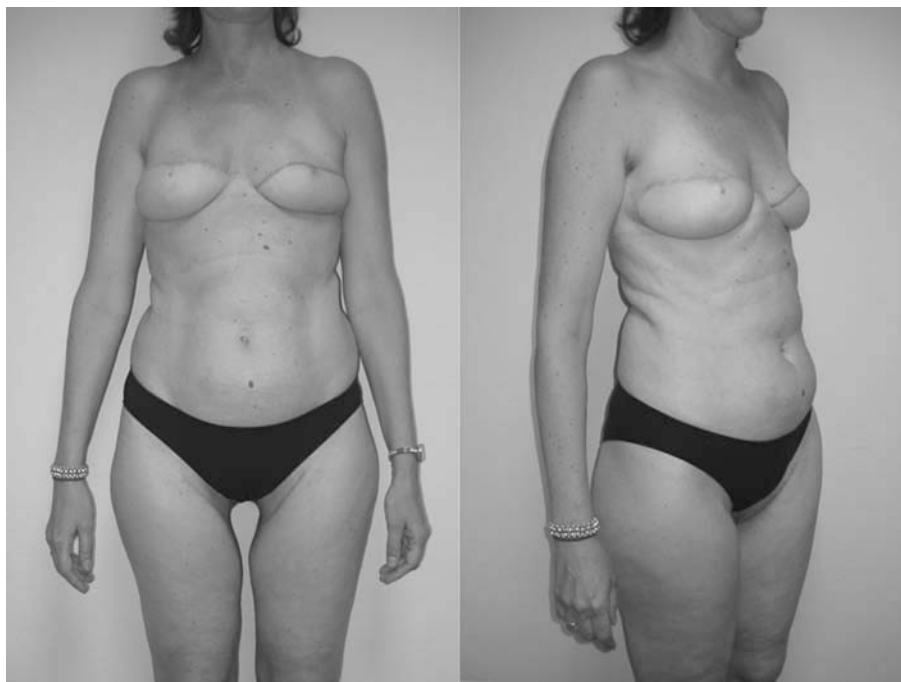


Figure 5 – Postoperative results in case 1. Observe the scar from the donor area in the root of the thigh.

sufficient volume to reconstruct the breast, and the quality of the skin from this area generally does not differ from the skin of the thorax. In expert hands, flap survival rates are above 95%, with few complications in the donor area.^{4,5}

Other types of free flaps have arisen as alternatives to abdominal flaps, such as the SGAP, the inferior gluteal artery perforator (IGAP) flap, and the Rubens flap. Although all provide sufficient tissue, especially those located in the gluteal area, the difficulty of this surgical technique, as well as the sequelae produced in the donor area, can hinder the use of this method. The gluteal flap tends to produce a depressed region in the gluteus that causes serious asymmetry in the case of unilateral reconstruction. In the Rubens flap, dissection of the abdominal musculature over the iliac crest can lead to the appearance of weak areas that might later develop into hernias.^{5,6}

The TMG flap is a good alternative for breast reconstruction with autologous tissue. The sacrifice made by the gracilis muscle is completely acceptable, since this is the weakest

of the thigh adductor muscles, it is easily dissected, and scarring patterns are very similar to those produced by aesthetic procedures performed on the internal side of the thighs such as thigh lifts.^{7,8}

Another advantage that we encountered was the reduced duration of the surgical procedure. This was due in part to the relatively rapid dissection of the TMG flap, and also to the ability of two different surgical teams to work simultaneously. In this manner, the thorax and thighs are approached at the same time, and the anastomosis can be performed without the simultaneous closing of the donor area interfering with the microsurgery being performed on the thorax. We must also consider that abdominal closing for DIEP flaps mobilises thoracic skin and slows the microsurgical process, and that flaps taken from the gluteal region require closing of the donor area first, and then the patient can be placed in a supine position for the microsurgical anastomoses.

With respect to the evaluation of the TMG flap, our experience has indicated that this technique should present

Table 4 – Technique evaluations: survival and complications, and patient satisfaction evaluations: volume, shape, and quality of the transferred tissue

	Flap	Survival	Complications in the recipient area	Complications in the donor area	Volume	Shape	Quality
Case 1	TMG 1	Complete	No	Dehiscence	4	4	4
	TMG 2	Complete	No	No	4	4	4
Case 2	TMG 3	Complete	No	No	3	3	3
Case 3	TMG 4	Complete	No	No	3	4	3
Case 4	TMG 5	Complete	No	Dehiscence	3	3	3
Case 5	TMG 6	Complete	Fatty necrosis	Dehiscence	4	4	4

TMG indicates transverse musculocutaneous gracilis flap.

no technical difficulties, as the pedicle is uniform and the cutaneous island well-perfused. The discrepancy observed in the calibre of the vessels for anastomosis should not be an impediment to experienced surgeons in the use of other types of free flaps. The internal region of the thighs provides a limited tissue volume, but this tends to be sufficient for reconstructing small to medium-sized breasts, which may limit the use of this technique depending on the needs of each patient. Another issue that must be taken into consideration is the pigmentation of the internal side of the thighs located close to the perineum. In some patients, skin in this area is darker and the patient may prefer another donor area. Furthermore, there may be excess pilosity in the skin from the donor area, which can be easily solved using traditional hair removal techniques or laser. In our opinion, TMG flaps should be indicated in cases of unilateral or bilateral breast reconstruction with autologous tissue in thin patients with small breasts, in patients with small or medium-sized breasts in which abdominal flaps cannot be used, and in cases of subcutaneous mastectomies in which implants are not desired.

In our opinion, the TMG flap is a comparable alternative to abdominal flaps in patients with small or moderate breast size, and is a feasible option when abdominal flaps cannot be used. However, we must remember that the use of internal side of the thigh may cause limitations in volume. The surgical time required allows for performing the transfers without prolonging time in the operating room, which constitutes savings in resources and even allows for simultaneous reconstruction of both breasts by trained teams in an acceptable amount of time. The evaluation of the reconstruction given by the patients is satisfactory or

good, with few complications and sequelae in the donor area, which are completely acceptable and similar to those produced in thigh lifts.

Conflict of interest

The authors affirm that they have no conflict of interest.

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