Implant-Based Breast Reconstruction vs TRAM Flap Breast Reconstruction: Solving Problems in a More Simple Way

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Abstract: *Background*: The surgical management of breast cancer is clearly evolving towards less invasive procedures. We are turning away from high priced medicine and are turning toward solving problems in more practical, simple and inexpensive ways.

The purpose of this study was to evaluate immediate breast reconstruction with expanders and implants versus pedicled TRAM Flaps in terms of costs, complication rates, revision rates, operating room time, length of hospital stay and number of secondary procedures.

Methods: A review of 152 immediate breast reconstructions over a 10 year period from april 2000 and December 2010 performed at our Institution, reconstructive techniques included TRAM Flaps in 70 patients and tissue expanders followed by implants in 82 patients.

Results: In the TRAM Flap group the mean operative time was 5.1 hours, the mean length of hospital stay was 4.2 days and revision surgeries were performed in 6 patients (8.5%). In the implant based group the mean operative time was 2.6 hours (including the mastectomy), the mean length of hospital stay was 1.9 days and revision surgeries were performed in 6 patients (7.3%).

On the basis of this review of autologous and prosthetic breast reconstruction in a 10 year period with a mean follow up time of 5.1 years for both groups, prosthetic reconstruction was significantly less expensive.

Keywords: Breast reconstruction, Breast Cancer, Complications, Flaps.

INTRODUCTION

Contemporary techniques provide numerous options for mastectomies and postmastectomy reconstruction [1]. Individualized selection of a reconstructive technique is essential in achieving a successful reconstruction [2].

Over recent decades the field of breast cancer has witnessed a considerable evolution and skin sparing mastectomy (SSM) has become an integral part of the management of breast cancer. SSM has become an established procedure and there is sufficient evidence to support the oncologic safety of SSM and Immediate breast reconstruction (IBR). A recent meta-analysis found that the risk of breast cancer recurrence among patients with breast cancer who underwent mastectomy and IBR was equivalent to those who underwent mastectomy alone [3,4].

The goal in breast reconstruction (BR) is to provide a breast substitute that achieves the optimal cosmetic result without interfering with or delaying the treatment of breast cancer; but also in solving problems in a more inexpensive way.

The choice of which option to use for BR depends on several factors including type of cancer, type of mastectomy, cost of the procedure, patient satisfaction, aesthetic considerations and quality of life. We now have options for reconstruction that yield excellent results with less morbidity to the patient.

Expanders and implant reconstruction is less invasive surgery, less operating time and shorter recovery time and hospital stay. Nevertheless it is a two stage procedure, often it is difficult to achieve symmetrical shape with the natural breast and there is always the need for future device replacements.

Autologous breast reconstruction (Tram Flap) is a major operative procedure, with donor site morbidity, with an added cost involved in additional operating time and a longer recovery and hospital stay.

The range of techniques available for immediate or delayed breast reconstruction has encouraged patients to participate more actively in a process of shared medical decision making.

Patients should be given an objective description of the options in breast reconstruction. The patient´s goals, energy, motivation, profession, available time and lifestyle should be part of the decision.

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Also factors entering into any individual choice include the surgeon´s training, practice profile, success with various procedures and available time.

We are turning away from high priced medicine and are turning toward solving problems in more practical, simple and inexpensive ways.

It is clear that uncomplicated expander reconstructions require substantially shorter operations than TRAM flaps and almost always require a shorter operative time, a shorter hospital stay and fewer surgical assistants [5, 6].

Many of the proposed benefits of performing expander-implant based breast reconstruction vs flaps have to do with less time investment toward the reconstructive process.

Both groups of patients usually require a second stage of fairly small magnitude procedures to complete their reconstructions.

If expander reconstructions can be done with a high degree of success then it should be the most economic alternative.

We looked at our 10 year experience with 152 consecutive immediate breast reconstructions, 82 consecutive immediate expander/implant breast reconstructions patients and a matched group of 70 TRAM Flap breast reconstructions were identified. Complication rates, revision rates, number of secondary procedures, total reconstructive time and length of hospital stay were compared.

Therefore, the objective of our study was to prove that immediate Breast Reconstruction with expanders/implants truly leads to less cost, time and need for revision surgery, decreasing health care costs as compared to reconstruction with flaps.

PATIENTS AND METHODS

Records were reviewed of all patients who had undergone breast reconstruction at our Institution between 2000 and 2010.

Of the 152 eligible patients, 82 underwent implant based breast reconstruction and 70 underwent Tram Flap breast reconstruction. Of the 152 mastectomies, 145 were skin sparing mastectomies (SSM), this is a routine procedure in our center. The other 7 mastectomies were not SSM due to extensive skin involvement by tumor.

All patients in this review were immediate reconstructions at the time of mastectomy for breast cancer. Only patients that completed their reconstruction, including nipple areola reconstruction were included.

In both groups operative time, length of hospital stay and number of revision surgeries were compared. Operating time and length of hospital stay for all admissions for each group included revisions, returns to the operating room and complications. Office procedures were not included (eg expansion).

Data were obtained for operative times (including the time required for the mastectomy) and number of hospital days for the initial procedure and for all subsequent procedures associated with the reconstruction including complications, contralateral aesthetic procedures and nipple areola reconstruction.

The surgical fees were not contemplated in this study since it is a public hospital. But personnel costs were included in the operative time for both the initial and subsequent procedures.

All patients that underwent implant based reconstruction received expanders followed by implants, 6 patients had bilateral expander/implants placed. Mean elapsed time since the initial procedure for both groups was 90 months (7.5 years). Mean follow up time for the implant group was 60 months (5 years). Mean follow up for the TRAM flap group was 64 months (5.2 years).

Several patients from each group had a contralateral cosmetic procedure in their second stage reconstruction.

All implant based reconstructions were performed using the Inamed style 133 MV textured anatomic expander (McGhan, Inamed Aesthetics, Ireland) with an integrated valve. All expanders were placed in a submuscular position, covered completely by the pectoralis, serratus anterior and rectus sheat.

All TRAM flap reconstructions were done with a pedicled flap, all patients had an abdominal prolene mesh at the donor site.

RESULTS

A total of 152 patients were included in this review. The mean age, body weight, smoking status and tumor stage based on the TNM classification was similar for both groups.

Table 1:

GROUP	NUMBER OF PROCEDURE	MEAN NUMBER HOSPITAL DAYS	MEAN OPERATION ROOM HOURS	NUMBER OF REVISION SURGERES
EXPANDER/IMPLANT	82	1.9	2.6	6
TRAM FLAP	70	4.2	5.1	6

A total of 70 patients underwent a pedicled TRAM Flap. In this group, the mean operative time was 5.1 hours, the length of hospital stay was 4.2 days (ranging between 3 and 8 days) and revision surgeries secondary to complications were performed in 6 patients (8.5%). There were no bilateral cases. The average operating time for subsequent procedures in this group was 2 hours with an average hospital stay of 2.6 days.

A total of 82 patients underwent expander-implant reconstruction. In this group the mean operative time was 2.6 hours (including the mastectomy), the length of hospital stay was 1.9 days (ranging between 1 and 4 days) and revision surgeries secondary to complications were performed in 6 patients (7.3%). Six patients were bilateral reconstructions (Table **1**). In this group, the average operating time for subsequent procedures was 1.3 hours and an average hospital stay of 1.2 days.

The costs of the expanders and implants were added to the corresponding group.

A total of 6 (7.3%) expanders/implants had to be removed or replaced. 3 (3.6%) of all permanent implants were exchanged for a second permanent prosthesis, implants were replaced for symptomatic capsular contracture in 3 patients (3.6%); and in 3 patients (3.6%) for exposure secondary to flap necrosis, these last 3 patients underwent a latissimus dorsi flap for coverage. All of the implant exposures were radiated patients. The mean time to implant exchange was 3.1 years (range 1.2 to 4.9 years).

Of the 6 patients in the TRAM flap group that had to undergo a reoperation, 3 patients (4.2%) had a Flap failure and 3 patients (4.2%) had partial flap necrosis. These last 3 patients were operated an average of 2 times for debridement and closure.

Analysis of overall complications showed no significant differences between the 2 groups (Table **2**). Statistical analysis was performed using a t test. P values of less than 0.05 were considered to be statistically significant.

53 patients (64.6%) of the implant based group and 41 patients (58.5%) of the TRAM Flap group had a cosmetic contralateral procedure.

The mean time to completion of reconstruction was 52 weeks (1 year) in the Tram Flap group and 54 weeks (1.2 years) in the tissue expander group. Considering most patients received chemotherapy and/or radiotherapy.

The mean costs of the surgical procedures along with revision surgeries, complications and aesthetic contralateral procedures and the mean number of hospital days were the main determinants of cost. Operating room time fees were 150 dollars per hour and the cost of hospital day was 100 dollars per day in both the TRAM flap group and the implant based group.

The operating room fees for subsequent procedures were also 150 dollars per hour in both groups and cost of hospital stay 100 dollars for both groups.

Table 2:

	EXPANDER/IMPLANT GROUP	TRAM FLAP GROUP
FLAP NECROSIS	3	3
EXPOSURE	3	-
CAPSULAR CONTRACTURE	3	-
FLAP FAILURE	-	3
INFECTION	0	0
FAT NECROSIS	-	0

P=0.522.

The average cost of TRAM Flap reconstructions was 1170 dollars compared with 580 dollars for the implant based group for the initial reconstructive process.

The average cost of subsequent procedures was 560 dollars for the TRAM Flap group and 315 dollars for the implant based group.

The results were statistically significant with $p < 0.001$ using the chi square method.

DISCUSSION

Women diagnosed with breast cancer who need a mastectomy and also choose an immediate breast reconstruction embark on a very long journey [7].

Even when oncologic and aesthetic considerations are taken in combination, almost all patients are suitable to implant or flap procedures. The ultimate success rate in any procedure, should always be the percentage of patients who at the end, achieve a successful reconstruction.

The main purpose of this study was to determine if there is a significant cost disadvantage between both types of reconstruction.

The multiplicity of techniques and range of procedure costs available for breast reconstruction have stimulated a discussion regarding the relative cost effectiveness of procedures. Nevertheless it is essential to remember that breast reconstruction remains a personal choice and cost analysis should only facilitate shared medical-patient decisions.

Prosthetic reconstructions are in the long run more likely to require revision surgery because of eventual device failures and the need for replacements [8].

Autologous breast reconstruction represents a larger initial operation and hospital stay but a more expeditous course to a stable reconstruction (Figure **1**).

Prosthetic reconstruction is a more simple procedure, with less scars, no donor site morbidity and less patient motivation. If the expander breast reconstruction fails there is no collateral damage.

Autologous breast reconstruction is a bigger operation and entails more surgical risk, more scars, more donor site morbidity and more patient motivation. If a flap procedure fails there is a high collateral damage.

Most complications occur within the first year of the procedure.

Advantages of tissue expansion include a quick, relatively simple procedure without donor site morbidity. Additionally the color and the texture of the reconstructed breast are identical similar to the contralateral breast [9] (Figure **2**). Also it requires less specialized training by the surgeon. The main drawbacks are difficulty in achieving ptosis, incidence of capsular contracture and in some cases results deteriorate with time. The most devastating complication is exposure and extrusion of the prosthesis which inevitably leads to a failed reconstruction.

Complication rates are significantly higher in irradiated patients. In a large center like ours there is a high percentage of patients who need irradiation after

Figure 1: TRAM Flap breast reconstruction, 6 years follow up. Results are maintained over time.

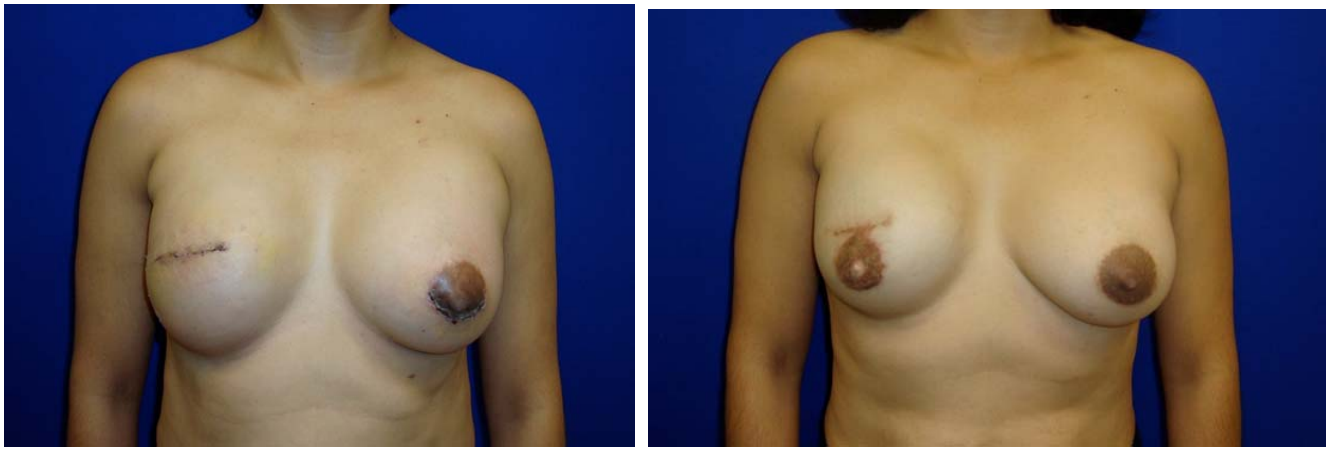

Figure 2: Expander/Implant breast reconstruction, 5 years follow up. Color and texture of the reconstructed breast are identical to the contralateral breast.

IBR because of proximity of the tumor to the chest wall, axillary metastases or tumor size. Autologous reconstruction is always our preference when faced with a patient who has or will receive radiotherapy. But there is still a number of patients in which it is not possible to determine if RT will be required [10].

TRAM Flap advantages include availability of a large volume of well vascularized autogenous tissue and versatility in balancing the opposite breast, patients who achieve a good initial result rarely develop unfavorable late sequelae and results do not deteriorate with time. Disadvantages include a major operation requiring exacting training and technique of the surgeon, a longer hospital stay, risk of partial flap loss, need for prosthetic mesh reinforcement of the abdominal wall, increased general complications of major surgery such as deep vein thrombosis and adult respiratory distress syndrome. Significant complications may occur with the Tram Flap. Pedicled TRAM flaps are no longer state of the art but still have very good outcomes and is still a very useful flap [11].

In this study the major components of the resource costs were hours of operating time, days of hospital stay and additional procedures. Since we were comparing two different techniques of breast reconstruction we included as much as possible standardized inclusion criteria to our study based on patient age, body mass index and radiation therapy.

Although cost alone should not dictate the reconstructive method, cost data can play an important role in identifying areas for growth and changes to direct allocation of resources at institutional levels [12].

This area is poorly addressed in the literature. Immediate breast reconstruction with expanders was significantly less expensive than reconstruction with Tram Flaps, but the question is whether in the long term the cost is still lower.

Spear *et al.* [13] in a study published with 140 patients, found that even in the long run the cost of the Tram Flap was still significantly higher than the cost of the implant-based reconstruction.

Although it is difficult to put a true endpoint to a reconstruction, we believe the last procedure should be nipple-areola reconstruction.

In terms of cost effectiveness probably older patients who undergo BR are better candidates for implant based reconstruction. These patients have less motivation for future corrective surgeries and fewer years to accumulate costs. Younger patients will probably benefit in the long term of BR with autologous tissue, because results with TRAM Flaps seem to be maintained over time [14,15] and will need less corrective surgeries. Although this is a controversial issue that deserves further study.

Our mean follow up time was 5.1 years. According to our study breast reconstruction with expanders and implants is less expensive.

Our study has some limitations, surgical and other personnel fees were not possible to be calculated.

CONCLUSION

The incorporation of cost-effectiveness can provide patients and surgeons with more information to optimize quality of care for individual patients. A longer follow up, with an objective assessment of the aesthetic outcome and consideration of costs and complications

of subsequent corrective surgery in these two groups would produce a more accurate cost-benefit analysis of these two methods of reconstruction.

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