Comparative study between the latissimus dorsi flap and thoracoabdominal flap in the coverage of skin defects after mastectomy for advanced and recurrent breast cancer

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Background
Breast cancer is the most common cancer among women, accounting for ~26% of all incident cancers. Modified radical mastectomy is still one of the most commonly used surgical techniques for breast cancer, and in some selected patient it is the only surgery to be performed. Skin defects after mastectomy is a major problem facing breast surgeons, especially in cases of recurrent breast cancer, locally advanced breast cancer as in the case of inflammatory breast cancer as well as male breast cancer.

Aim
The present study compares the thoracoabdominal flap and the latissimus dorsi flap in the coverage of skin defects after mastectomy.

Materials and methods
The present study was conducted on 60 patients with recurrent, locally advanced female breast cancer and male breast cancer after receiving neoadjuvant chemotherapy, who were candidates for modified radical mastectomy that resulted in chest wall defect and needed skin coverage. Patients were admitted to the Surgical Oncology Unit, Alexandria Main University Hospital. Patients were randomly classified into two equal groups, of 30 patients each.

Result
Patients were randomly classified into two equal groups. Group A had modified radical mastectomy with coverage of defect using the latissimus dorsi flap. Group B had modified radical mastectomy with coverage of defects using the thoracoabdominal flap, and there was no significant difference between the two groups in terms of age, size of breast, site of lesion, neoadjuvant treatment, size of mass, contraceptive pills, and size of the defect. A statistical significance between two groups were found in the size of the harvested flaps (<0.001) and the duration of the operation (<0.001).

Conclusion
Chest wall defects following mastectomy can be covered by use of the latissimus dorsi flap or the thoracoabdominal flap. The advantages of thoracoabdominal flaps over latissimus dorsi flaps is the size of the harvested flap size and duration of operation as well as it is more applicable in Egyptian females with a large belly skin and heavily infiltrated axilla in locally advanced breast cancer (LABC).

Keywords:
breast cancer, chest wall defect, latissimus dorsi, locally advanced, modified radical mastectomy, recurrent, thoracoabdominal

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Introduction

Breast cancer is the commonest cancer among women, accounting for about 26% of all incident cancers [1]. Surgical management of breast cancer includes various techniques and operations, but mastectomy remains a major option especially in cases of diffuse skin involvement by malignant changes [2]. Skin defects after mastectomy is a major problem facing breast surgeons, especially in cases of locally advanced breast cancer as in the case of inflammatory breast cancer [3]. A higher incidence of LABC is present in developing countries that makes the problem of skin defects quiet common. Also cases of recurrent breast cancer after mastectomy in the form of skin nodules or masses are among conditions that may result in skin defects after mastectomy [4]. Male breast cancer is a rare condition that accounts for about 1% of all breast cancer cases

[5]. Mastectomy in male breast cancer may results in chest wall skin defects due to the rudimentary nature of male breast tissue, usual retroareolar location with higher rates of Neoadjuvant chemotherapy (NAC) involvement and more skin complications following neoadjuvant treatment by radiotherapy that requires more skin excision [6,7].

Local control of the malignant changes in mastectomy is achieved by attaining negative margins. In both advanced and recurrent breast cancers both chemotherapy and radiotherapy are used to decrease the size of tumor thus reaching free margins and better respectability. However, due to extensive extension of malignant changes in the skin of breast or mastectomy flaps make it is difficult to reach free margins without skin defects even with enlarging the extent of flap dissection beyond the level of mastectomy flapping as the abdominal advancement flap [8].

Thoracic wall reconstructive surgeries for coverage of skin defects may include use of myocutaneous or fasciocutaneous flaps. Use of composite flaps in chest wall reconstruction has an upper hand over skin grafts due to less durability and tolerability of skin grafts to radiotherapy and inability of use of skin grafts in state of extensive excision of pectoral muscles in case of locally advanced, recurrent, or male breast cancer [9].

The latissimus dorsi flap is an example of myocutaneous flaps; depending on the thoracodorsal pedicle this flap is harvested after design of elliptical skin incision with dissection and flapping of the muscle, and then through a tunnel it is transferred to the site of the defect for coverage [10].

The thoracoabdominal fasciocutaneous flap is a rotational advancement flap depending on the posterior intercostal perforating branches. This flap is used widely in the reconstruction of defects after mastectomy especially in Egyptian females with redundant anterior abdominal wall skin [11].

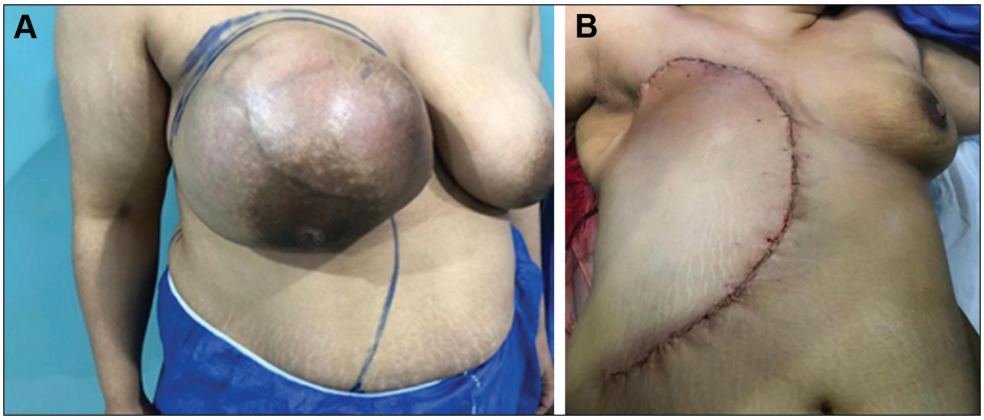
Both latissimus dorsi myocutaneous flap and thoracoabdominal fasciocutaneous flaps are versatile flaps, can cover large defects, technically easy to dissect with no need of microvascular techniques and of less complication especially flap necrosis as compared with other types of flaps.

Patients and methods

This study was conducted on 60 patients, who had locally advanced breast cancer or recurrent breast cancer after modified radical mastectomy and male breast cancer and underwent mastectomy that resulted in skin defects and admitted in the Surgical Oncology Unit at Alexandria Main University Hospital to undergo surgery from March 1, 2021 to March 1, 2022. Half of the patients will undergo defect reconstruction using the latissimus dorsi flap (group A) while the other half will use thoracoabdominal flap (group B).

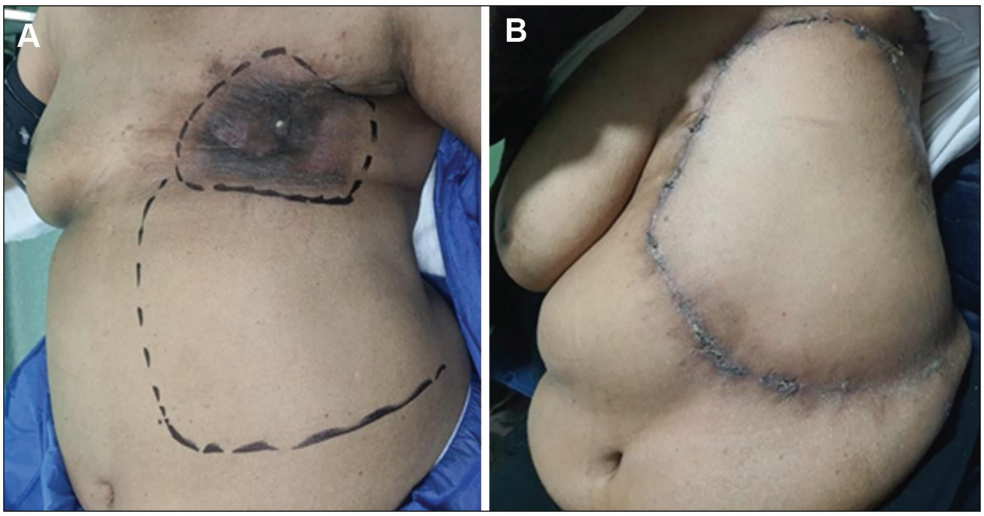
Thoracoabdominal flap is a rotational advancement fasciocutaneous flap from the skin and subcutaneous tissue of the anterior abdominal wall depending on the lateral perforators of the intercostal arteries at the level of the anterior border of the latissimus dorsi muscle [12]. The flap was designed to extend superiorly from the edge of the thoracic defect, inferiorly at the level of the umbilicus that may extend to the ipsilateral anterior superior iliac spine, medially at the midline and laterally at the level of the anterior axillary line. The dissection of the flap was done just superficial to the rectus sheath and external oblique aponeurosis and then advanced and rotated superficially to cover the defect (Figs 1–3).

Figure 1



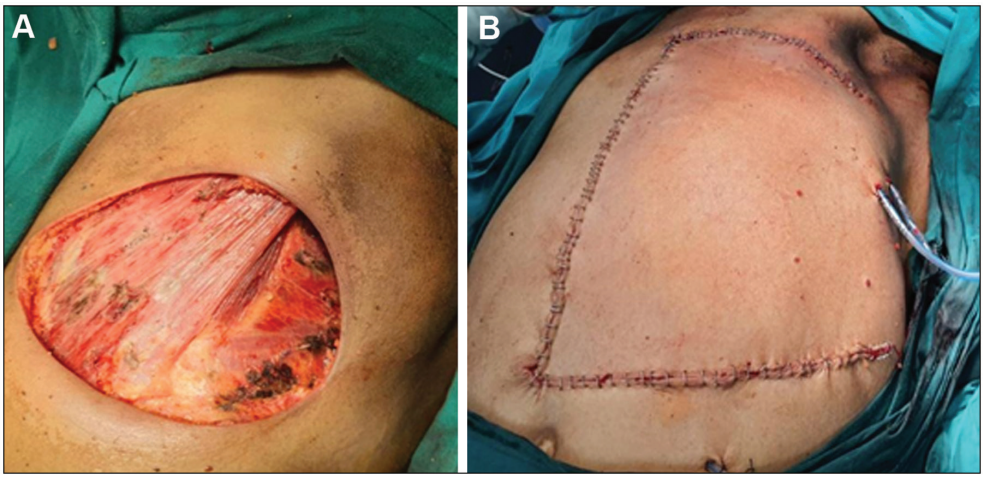
(a–b) A case of LABC managed by mastectomy with a defect reconstructed by TA flap. TA, thoracoabdominal.

Figure 2



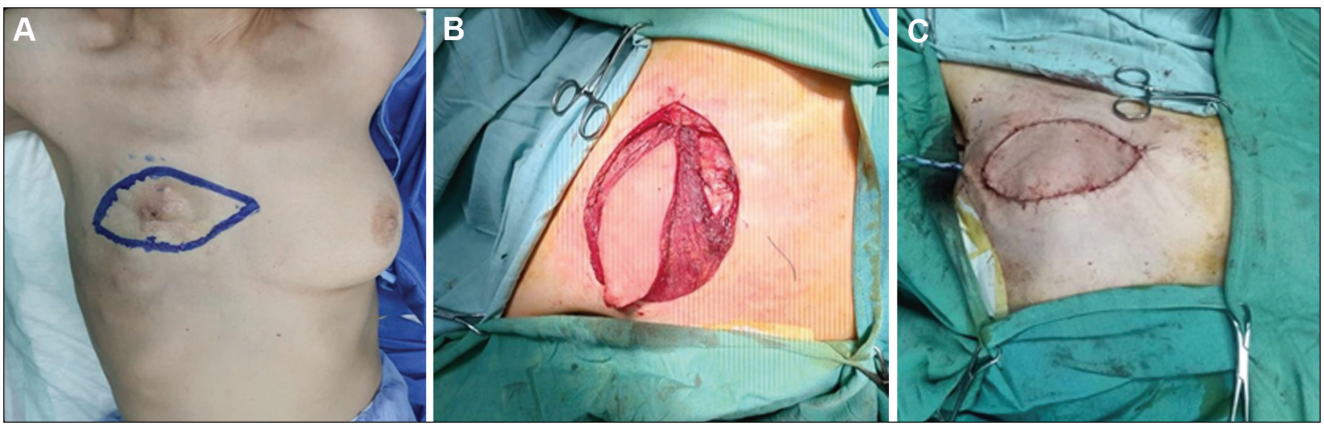
(a–b) A case of local recurrence managed by resection and reconstruction by TA flap. TA, thoracoabdominal.

Figure 3



(a–b) A case of male breast cancer with a defect following mastectomy reconstructed by TA flap. TA, thoracoabdominal.

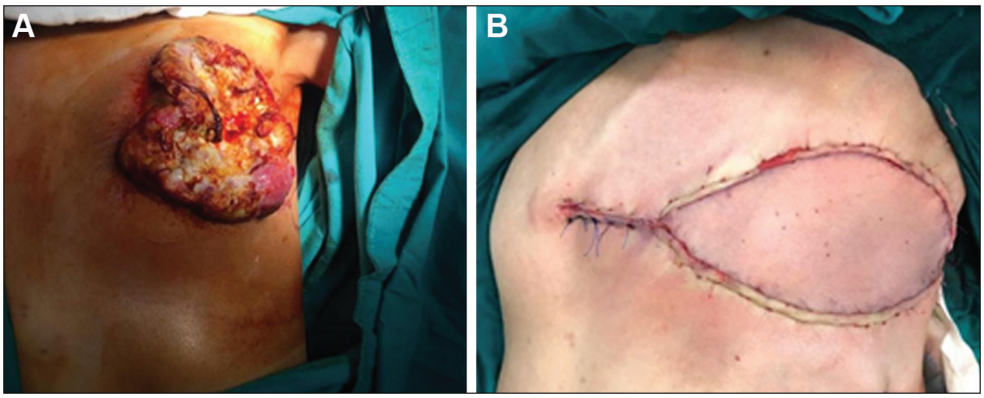
Figure 4



(a–c) A case of local recurrence managed by excision and LD flap. LD, latissimus dorsi.

Latissimus dorsi myocutaneous flap was marked on the back as a skin ellipse over a fat roll on the back and oriented with the long axis along the relaxed skin tension lines. After skin incision the dissection is done till the free superior and anterior edges of the latissimus dorsi muscle. Dissection continued

Figure 5



(a–b) A case of male breast cancer managed by mastectomy and LD flap. LD, latissimus dorsi.

medially till the thoracolumbar fascia till exposure of the erector spinae muscle, followed by incision of the muscle inferiorly may be at the level of iliac crest [13]. Elevation of the flap starts medially with caution not to include the deep muscles as the erector spinae and serratus posterior inferior muscle till the tendentious insertion of the muscle to be mobilized through an axillary tunnel with preservation of the thoracodorsal bundle to the thoracic defect (Figs 4–5).

Ethical approval

This research was performed at the Department of General Surgery, Alrxandria University Hospitals. Ethical Committee approval and written, informed consent were obtained from all participants.

Results

The distribution of the studied 60 patients were as follows: 42 (70%) patients were aged between 40 and 60 years while seven (11.67%) patients were aged less than 40 years and 11 (18.3%) patients were aged more than 60 years. Regarding marital status, 57 (95%) patients were married while three (5%) patients were single. Regarding contraceptive pills, 36 (60%) patients did not take OCPs while 24 (40%) patients received OCPs.

Most of the studied cases were left-sided breast cancer, 31 cases (19 cases in group A and 12 cases in group B) while the remaining 29 cases were right-sided breast cancer (11 cases in group A and 18 cases in group B). Upper outer quadrant was the most common site in the studied cases, 33 cases (15 cases in group A and 18 cases in group B) followed by retroareolar lesions being present in 18 cases (11 in group A and seven in group B).

The BMI in group A ranged from 23.2 to 36.8 with a mean of 29.3, while in group B it ranged from 24.3 to 36.2 with a mean of 30.5, the difference between the two groups is statistically insignificant (P=0.644).

According to chronic concomitant diseases, in group A 22 (73.3%) patients had got concomitant diseases in which seven (23.3%) patients were diabetic; 14 (46.7%) patients were hypertensive and one (3.3%) patient was HCV positive while in group B 19 (63.3%) patients had got concomitant diseases in which nine (30%) patients were diabetic and 10 (33.3%) patients were hypertensive. The differences between the two groups were statistically insignificant in all variables.

Clinical presentation and breast cup size were also compared between the two groups; 27 patients had recurrent breast cancer with 14 (46.7%) patients in group A and 13 (43.3%) patients in group B; 28 patients were presented as LABC, 13 (43.3%) patients in group A and 15 (50%) patients in group B. Five patients had male breast cancer; three (10%) patients in group A and two (6.7%) patients in group B. Regarding the cup size, in the LABC cases 16 patients were of cup size B; seven (23.3%) patients in group A and nine (30%) patients in group B. Twelve patients were of cup size C equally divided, six (20%) patients in both groups. Also male breast cancer was included in the study and five patients were male, all of them were of cup A.

In both LABC and male breast cancer groups (33 patients), all of them had received neoadjuvant chemotherapy with partial response in 20 patients and poor response in 13 patients.

According to the longest dimension of the lesion, in group A it ranged from 1 to 5.6 cm with a mean of 2.84 cm while in group B it ranged from 1.5 to 5.5 cm with a mean of 3.14 cm.

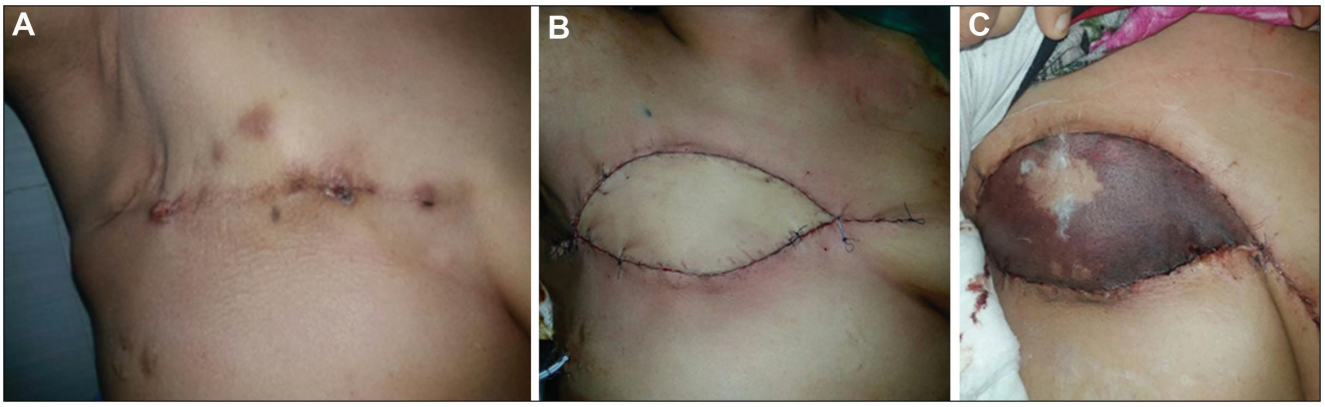
Immunohistochemistry was done for all cases and showed in group A: 10 (33.3%) patients were luminal, 11 (36.7%) patients were basal, and nine (30%) patients were HER2/neu enriched while in group B nine (30%)

Table 1 Comparison between the two studied groups according to size of defect, flap size of flap, and operation duration

	LD (*n*=30)	TA (*n*=30)	*t*	*P*
Size of defect (cm^2)				
Mean±SD	121.4±32.9	119.3±36.51	0.238	0.813
Median (Minimum–maximum)	119 (70–210)	113.5 (58–202)		
Size of flap (cm^2)				
Mean±SD	284±66.2	397.1±98.4	5.224*	<0.001
Median (minimum–maximum)	280 (140–450)	380 (225–650)		
Operation duration (min)				
Mean±SD	185.8±18.6	152.5±24.6	5.919*	<0.001
Median (minimum–maximum)	182.5 (160 -140)	152.5 (110 -200)		

LD, latissimus dorsi. *The advantage of thoracoabdominal flap.

Figure 6



(a–c) A case of local recurrence with LD flap with necrosis of the flap. LD, latissimus dorsi.

patients were luminal, 11 (36.7%) patients were basal, and 10 (33.3%) patients were HER2/neu.

Regarding the size of the defect resulted from mastectomy, in group A it ranged from 70 to 210 cm^2 with a mean of 121.4 cm^2 while in group B it ranged from 58 to 202 cm^2 with a mean of 119.3 cm^2; the differences between the two groups were statistically insignificant (*P*=0.813).

On comparing both groups regarding the size of the flap harvested, in group A the size ranged from 140 to 450 cm^2 with a mean of 284 cm^2 while in group B the size ranged from 225 to 650 cm^2 with a mean of 397.1. The differences between the two groups were statistically significant (*P*<0.001).

Regarding operative time, in group A it ranged from 160 to 240 min with a mean of 185.8 min while in group B it ranged from 110 to 200 min with a mean of 152.5 min. The differences between the two groups were statistically significant (*P*<0.001) (Table 1).

Complications in group A was found in eight (26.7%) cases; three of them was wound dehiscence and partial flap necrosis (Fig. 6) and five cases with seroma especially in the donor site at the back, while in group B there were two complicated cases one (6.7%) with seroma and another with wound partial flap necrosis.

The difference between the two groups regarding the development of complications was statistically significant (*P*=0.038).

Discussion

Breast cancer is the most common cancer in women worldwide. In Egypt, it constitutes 25.5% of their cancers and represents about 19% of cancer deaths. A high percentage of breast cancer cases in developing countries is presented in the late stages as locally advanced breast cancer or with recurrence, due to social lack of awareness, screening or medical infrastructures as well as delay in the referral system [14]. Both LABC and recurrent breast cancer after mastectomy may show inadequate response to chemotherapy with local extension of the malignant changes into a wider area of breast skin that makes proper surgical excision by mastectomy impossible without chest wall defects [15]. Surgical management of male breast by mastectomy also may face the same problem due to the nature of male breast with scanty breast tissue that makes

higher percentage of chest wall skin defects following mastectomy [16].

First attempts for the reconstruction of skin defects following mastectomy was at the first half of the 20th century by secondary intention and staged skin graft with poor results with cosmetic outcome and subsequent oncological treatment [17].

The first attempt for use of flaps for coverage of mastectomy defects was by Ignio Tansini at by the use of Latissimus dorsi as a myocutaneous flap without gaining popularity till it was reintroduced by Olivari and then Boswick at the late quarter of the 20th century [18].

Thoracoabdominal fasciocutaneous flap was first introduced by Brown *et al.* [19] for coverage of chest wall defects.

In our study of comparing both latissimus dorsi myocutaneous flap and thoracoabdominal fasciocutaneous flap for coverage of chest wall defects following mastectomy, we found that both flaps are versatile flaps for use for coverage with advantages of ability of harvesting large-sized flaps with rich blood supply and prolonged durability and less complications in comparison with other ways of coverage as split thickness graft, TRAM flaps, or abdominal advancement flaps.

We noticed multiple advantages of thoracoabdominal flaps over latissimus dorsi flaps; thoracoabdominal flaps is more suitable for Egyptian females with higher percentages of larger anterior abdominal skin suitable for harvesting larger sized fasciocutaneous flaps. Thoracoabdominal flaps has the advantage of less operative time and the ability of harvesting much larger sizes of skin for coverage.

Another advantage of thoracoabdominal is there is no need for changing the position during the operation multiple times as done with latissimus dorsi flaps [20] and thus with shorter duration. Seroma formation at the donor site was much less at thoracoabdominal flaps with less discomfort for patients [21].

In thoracoabdominal flaps, the dissection is completely in the anterior abdominal wall without any meticulous dissection in muscular planes or around neurovascular bundles. In latissimus dorsi flaps preservation of the thoracodorsal bundle is crucial for viability of the flap that in LABC with heavy axillary lymph node infiltration makes it difficult for proper preservation of the thoracodorsal bundle [22] and subsequently the viability of the flap as we noticed that in a case of recurrent breast cancer that previously underwent mastectomy for inflammatory breast cancer in which the first operation showed unnoticed cut of the bundle that affects the viability of the latissimus dorsi flap in the second operation (Fig. 6). Thus, we noticed that thoracoabdominal is a much easier technique and more suitable in set of heavy axillary infiltration and less meticulous dissection so a short learning curve. Another point to mention in cases of recurrent breast cancer is that it is difficult to evaluate the integrity of the thoracodorsal bundle unless by Doppler [23] and computed tomography angiography making the decision toward the choice of thoracoabdominal flap more applicable.

Conclusion

Both latissimus dorsi and thoracoabdominal flaps are versatile viable flaps for coverage of chest wall defects following mastectomy with advantages of thoracoabdominal flaps being simple, reliable, cost effective, and suitable for Egyptian patients and LABC. Thoracoabdominal flap is the best versatile alternative to latissimus dorsi flap keeping this workhorse latissimus dorsi for further inquiries.

Patients with latissimus dorsi flap may show some sort of shoulder dysfunction in many patients [23].

Those patients may require physiotherapy to restore the shoulder function.

Thoracoabdominal flap has an advantage of not causing this shoulder dysfunction.

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Conflicts of interest

There are no conflicts of interest.

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