

Can pregnancy following muscle-sparing transverse abdominis myocutaneous (MS-TRAM) flaps be safe on abdominal wall?

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Summary

Objective: The purpose of this study is to investigate patients with pregnancy following muscle-sparing transverse abdominis myocutaneous (MS-TRAM) flaps and introduce some cases to determine outcomes including safety and timing of pregnancy following MS-TRAM flap. **Materials and Methods:** A retrospective review of 917 breast reconstruction between March 2000 and September 2017 was performed. Of these 917 patients, 35 patients aged under 40 years visited the Department of Obstetrics following breast reconstructions using MS-TRAM flaps. Pregnancy following MS-TRAM flaps was determined by reviewing medical records and/or telephone interviews. **Results:** Two patients were followed up accordingly and they proceeded to delivery. Postpartum follow-up showed no complication. No evidence of disease or abdominal wall complication was found during a maximum of nine years. **Conclusions:** This case study highlights successful pregnancy following MS-TRAM flap within the shortest interval after surgery.

Key words: Abdominal wall; Breast reconstruction; Delivery; Fascia; Pregnancy; TRAM.

Introduction

Transverse rectus abdominis myocutaneous (TRAM) flap is currently the preferred method of autologous breast reconstruction. Surgical technique of breast reconstruction has evolved over the years, with increasing trend of muscle-sparing (MS) TRAM flap. However, the safety of pregnancy and birth mode following MS-TRAM flap in young patients are controversial. Since autologous breast reconstructions after mastectomy on young age are increased, patients are generally concerned about the safety of pregnancy after autologous breast reconstructions.

A few cases of pregnancy after conventional non-MS TRAM flaps have been reported [1-3]. Chai *et al.* [1] have reported no complications in pregnancy after pedicled conventional non-MS TRAM flap, representing the shortest period between flap and pregnancy reported to date. Therefore, the authors hypothesized that pregnancy following MS-TRAM flaps might be more safe than non-MS TRAM flaps due to lower donor site mobility.

The purpose of this study was to investigate patients with pregnancy following MS-TRAM flaps and introduce some cases to determine outcomes including safety and timing of pregnancy following MS-TRAM flap.

Patients and Methods

This study was approved by the Institutional Review Board. Written informed consents were obtained from all patients. The medical records of all consecutive patients who underwent autologous breast reconstructions between March 2000 and September 2017 by a senior author were reviewed retrospectively. Pat-

ient data were linked with hospital records. Linked data were obtained from Korea University Hospital Data Collection which was regularly audited to minimize data inaccuracy.

This study analyzed collected data of 917 consecutive patients who underwent breast reconstruction. Among these 917 patients, those who met the following inclusion criteria were included in this study: patients who underwent MS-TRAM flap, patients aged under 40 years, and patients with obstetric clinic visit. Patients were excluded from this study if they underwent conventional non-MS TRAM flap or if they were lost to follow up. Thirty-five patients met the inclusion criteria (Figure 1). Of these 35 patients, pregnancy following MS-TRAM flaps was determined by reviewing medical records and/or telephone interviews.

Results

Two patients were followed up accordingly. Therefore, the authors report two cases of pregnancy following MS-TRAM flaps known to be difficult to investigate in clinical or cohort studies.

Case 1

A 39-year-old patient with breast cancer presented in October 2009. A skin-sparing mastectomy and a free MS-2 TRAM flap breast reconstruction were planned. The patient had a history of caesarean section. Therefore, the authors confirmed whether the deep inferior epigastric perforator (DIEP) was intact. Before surgery, the authors used abdominal computed tomographic angiography and Doppler scanning to evaluate the DIEP and confirmed its availability for donor vessel. Urinary human chorionic gonadotropin for pregnancy was negative.

In December 2009, the patient underwent an immediate breast reconstruction via an ipsilateral free MS-2 TRAM flap. The rectus muscle with its anterior rectus fascia measuring about 3.0×5.0 cm was harvested to minimize donor site morbi-

Published: 15 February 2020

Clin. Exp. Obstet. Gynecol. - ISSN: 0390-6663
XLVII, n. 1, 2020
doi: 10.31083/j.ceog.2020.01.4966

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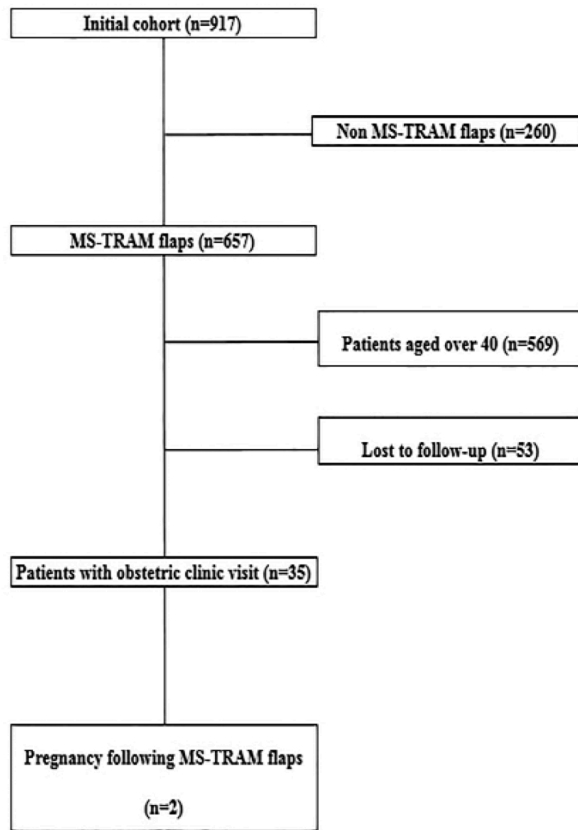


Figure 1. — Flow chart of patients included in this study (n = number of patients).

dity. The fascial layer was repaired using a standard technique with interrupted, non-absorbable, figure-of-eight sutures reinforced with locking running sutures without mesh reinforcement. The patient was positioned in a semi-Fowler position to reduce abdominal skin tension on the donor site for three days after the surgery. An abdominal binder was recommended for a month. The patient was advised to sustain contraception during the first postoperative year. However, six months thereafter, the

patient complained of abdominal distension thought to be an abdominal hernia or a distant metastasis. An abdominal CT was performed to evaluate the abdominal distension. It revealed a fetus with estimated gestational age of 28 weeks (Figure 2). The patient had become pregnant just before the MS-2 TRAM flap. Obstetric ultrasound revealed a normal fetus. The patient decided to carry the pregnancy to term. The abdominal wall integrity of the donor site was preserved.

In July 2010, the patient proceeded to delivery without abdominal complications at 36 weeks of gestation through caesarean section. The baby presented normal Apgar scores and psychomotor development postpartum. Postpartum follow-up over nine years in the clinic showed no evidence of disease or abdominal wall complications, such as fascial tears, enlargement of the incision scar, or abdominal hernia (Figure 3).

Case 2

A 37-year-old patient with BMI of 23.1 required mastectomy for positive medical history of breast cancer in March 2013. Two-stage expander/implant reconstruction was rejected by the patient as she did not want to undergo second surgeries. Therefore, the patient underwent skin-sparing mastectomy and an immediate breast reconstruction via an ipsilateral free MS-TRAM flap. The patient had a history of caesarean section. Urinary human chorionic gonadotropin for pregnancy before breast reconstruction was negative. The rectus muscle with its anterior rectus fascia measuring about 2.7×3.8 cm was harvested to minimize donor site morbidity (Figure 4). The fascial layer was repaired using a standard technique without mesh reinforcement. At six months post-operation, the patient became pregnant and the patient decided to carry the pregnancy to term. In June 2014, the patient proceeded to delivery without abdominal complications at 38 weeks of gestation through caesarean section. A healthy 3.6-kg baby was born. The baby presented normal Apgar scores and psychomotor development postpartum. Postpartum follow-up over a year in the clinic showed no evidence of disease or abdominal wall complications (Figure 5).

Discussion

Breast cancer has been one of the leading cancers. Its incidence is expected to increase continuously. The incidence

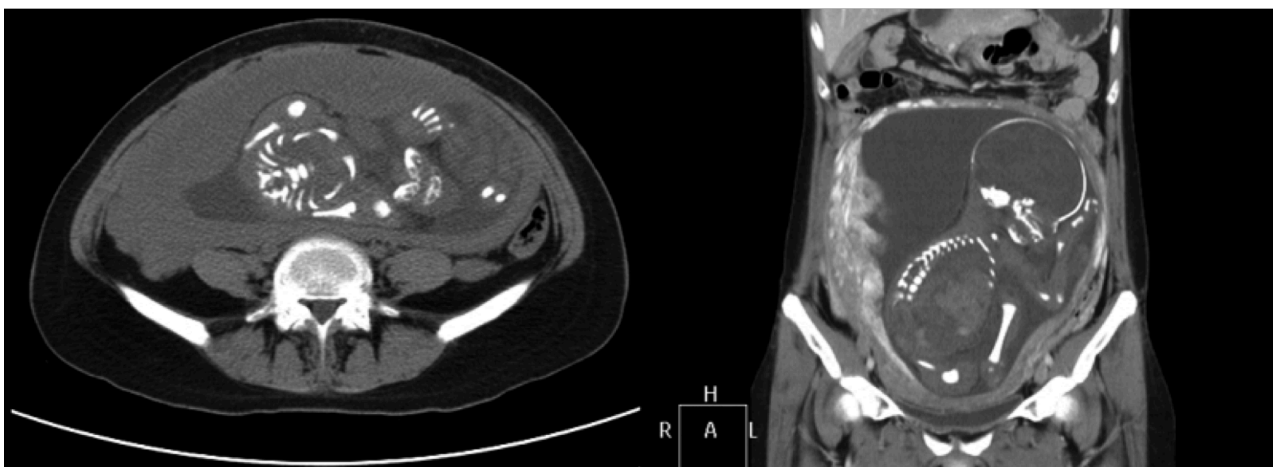


Figure 2. — Abdominal CT showing a fetus at 28 weeks of gestation after MS-TRAM flap. Axial view (left), and coronal view (right).



Figure 3. — A patient became pregnant just before MS-TRAM flap. Postoperative photograph of patient at five weeks after MS-TRAM flap (left). Postoperative photograph at 4 months after surgery (20 weeks of gestation) (middle). Postoperative photograph at ten months after surgery (1.5 months after delivery) (right).

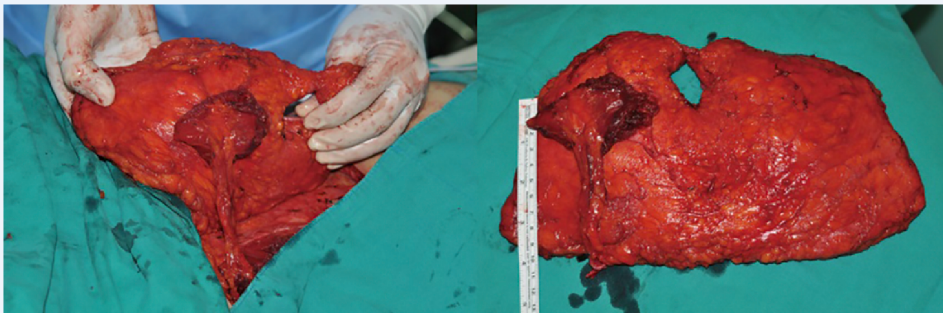


Figure 4. — An intraoperative photograph after flap harvest of MS-TRAM flap.

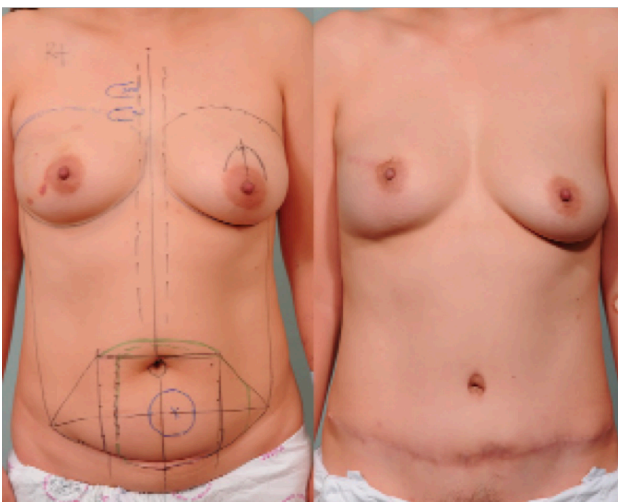


Figure 5. — A patient became pregnant after six months following MS-TRAM flap. Preoperative photograph of patient with design for MS-TRAM flap (left). Postoperative photograph at three years after surgery (1.8 years after delivery) (right).

patients. However, many breast cancer patients of child-bearing age are concerned about pregnancy following breast reconstructions.

A few case reports have shown that pregnancy following non-MS TRAM flap has abdominal complications [5, 6]. Potential risk of pregnancy after non-MS TRAM flap is relatively high. Early pregnancy is not recommended. When patients who have undergone non-MS TRAM flap become pregnant, they should be advised of the possibility of prolonged second-stage labor and abdominal hernia due to absence of the rectus muscle. Close observation during pregnancy and caesarean section are recommended.

Carramaschi *et al.* [5] reported seven cases of pregnancy following TRAM flap using meshes for abdominal wall reinforcement. Two of these seven patients had abdominal wall bulging. Other reports which describe pregnancy following pedicled non-MS TRAM flaps have shown donor site related complications such as abdominal bulge which resolved spontaneously and hernias which were repaired [1-3]. Therefore, the authors suggested that patients who use meshes for fascia repair during TRAM flap should also be monitored for attenuated abdominal walls during pregnancy [5]. However, free MS-TRAM flap may maintain abdominal strength and contour. It may be recommended when patients strongly

of breast cancer in women of childbearing age is 59% [4]. Mastectomy and immediate autologous breast reconstruction using TRAM flap are currently used for breast cancer

desire pregnancy. In addition, the authors suggest that the risk of abdominal wall complication after pregnancy is highly relevant to the defect size and the repair method for rectus abdominis muscle and fascia during operation.

The exact mechanism of abdominal wall activity remains unknown. One mechanism associated with fewer abdominal wall complications in pregnancy following MS-TRAM flap might involve slow expansion of the abdominal wall and neovascularization mediated by hormone effects [7]. The abdominal wall is composed of two superficial layers of fascia including Camper's and Scarpa's fascia and five muscles, including rectus abdominis, external and internal oblique muscles, pyramidal and transverse abdominal muscles, and rectus sheath. Therefore, a defect of the rectus abdominis muscle after MS-TRAM flap may be compensated by the other three muscles. In addition, the abdominal wall has passive and active physiological function. The passive function entails equal distribution of pressure to prevent herniation during pregnancy. These abdominal muscles mediate the active function when the abdominal pressure is increased during fetal growth and delivery [3].

Recent studies have demonstrated no significant difference in abdominal wall morbidity between DIEP and MS-TRAM flaps. Dissection of the DIEP may increase the risk of damage to rectus muscle more than MS-TRAM flaps [8, 9]. Momeni *et al.* [10] have reported that the MS-TRAM flap with fascia closure and wide anterior rectus plication without mesh do not increase complication rates of abdominal wall morbidity. Selber *et al.* [11] have compared the functional impact of abdominal wall between DIEP and MS-TRAM flaps. A flexion of the upper rectus abdominis muscle in MS-TRAM flaps declined significantly compared to DIEP flaps, without showing significant changes in the lower rectus abdominis or functional independence. A flexion of the lower rectus abdominis muscle is more important than that of the upper rectus abdominis muscle in pregnancy. In addition, the upper and lower muscles can return to nearly full strength after four months to one year following MS-TRAM flap [12]. Therefore, pregnancy may be safe after four months post-operation regardless of the type of flaps. However, when patients with flap surgery become pregnant before four months following breast reconstruction, the type of flaps plays an important role in determining the outcome. The authors recommend MS-TRAM flap without mesh to patients who consider pregnancy after the flap surgery. Further studies are needed to determine the effect of TRAM flaps on abdominal wall strength and physiology in pregnancy.

The first case of the present study was the first to report pregnancy before and after MS-TRAM flap without fascial or skin complications. Furthermore, the first case presents the shortest interval ever reported for successful pregnancy following all types of TRAM flaps without complications. No large-scale study has suggested the app-

ropriate timing of pregnancy after TRAM flap surgery because ethical concerns impede the design of such study. The potential risk of pregnancy after TRAM flaps is high. Thus, early pregnancy after TRAM flap is not recommended. However, findings of this study may help other obstetric and plastic surgeons contemplating pregnancy following abdominoplasty or TRAM flaps in young childbearing aged patients.

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