Successful free flap salvage upon venous congestion in bilateral breast reconstruction using a venous cross-over bypass: A case report

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Abdominal free flaps such as the muscle sparing transverse rectus abdominis myocutaneous (ms-TRAM) or deep inferior epigastric artery perforator (DIEP) flap represent the gold standard in autologous breast reconstruction. We describe a salvage procedure during bilateral free flap breast reconstruction due to insufficient venous drainage using a venous cross-over bypass. A 54-year-old woman with a thrombosis of the left subclavian port-system in the medical history was elected for simultaneous bilateral breast reconstruction with ms-TRAM and DIEP flaps. Intraoperatively, a venous congestion of the DIEP flap, which was connected to the left cranial internal mammary vessels, appeared. In the absence of sufficient ipsilateral venous recipient vessels, we performed a salvage procedure requiring a 15 cm long saphenous vein graft and presternal subcutaneous tunneling. The flap vein was anastomosed end-to-end with the contralateral caudal internal mammary vein using a coupler system. The postoperative course was uneventful and both flaps survived. We describe the cross-over venous emergency bypass as a useful tool in unexpected venous thrombosis during bilateral free flap breast reconstruction.

1 | INTRODUCTION

Following the establishment of the pedicled latissimus dorsi flap in 1972 and the pedicled transverse rectus abdominis myocutaneous (TRAM) flap in 1983, reconstructive breast surgery has experienced a consequent evolution. Undoubtedly, autologous breast reconstruction improves the quality of life in patients upon mastectomy (Ludolph et al., 2015).

The free TRAM flap with its muscle sparing variations is a popular method for autologous breast reconstruction. Since its introduction in 1989 the deep inferior epigastric artery perforator (DIEP) flap has become a favorable option due to its lower donor side morbidity. Mostly, the internal mammary artery and vein serve as recipient vessels due to their reliable location, large vessel diameter and high flow (Saint-Cyr, Youssef, Bae, Robb, & Chang, 2007). Current advances in microsurgery allow simultaneous bilateral breast reconstruction using free abdominal or transverse musculocutaneous gracilis flaps (Bodin et al., 2015; Momeni & Kanchwala, 2016).

Although autologous breast reconstruction has become a safe procedure in high volume centers, venous congestion remains a serious complication. Here, we describe a case of insufficient venous flow in the ipsilateral mammary vein and consecutive venous flap congestion in simultaneous bilateral breast reconstruction. Using a 15 cm long saphenous vein graft anastomosed to the contralateral internal mammary vein and subcutaneous presternal tunneling, we were able to provide sufficient venous drainage.

2 | CASE REPORT

We report on a 54-year-old woman with a history of axilla dissection and radiation therapy upon cancer of unknown primary syndrome of the right axilla. Continuative diagnostics revealed a ductal carcinoma of the right breast. The patient underwent bilateral mastectomy and chemotherapy. During chemotherapy a thrombosis of the left subclavian port-system occurred which was managed with marcup. After accomplishing chemotherapy, the port-system was explanted and after an inconspicuous follow-up period of 5 years the patient desired to undergo autologous breast reconstruction.
A preoperative thrombophilia screening was performed without any anomalies. A computed tomography angiography revealed sufficient perforator vessels originating from the inferior epigastric vessels (Figure 1). A muscle sparing (ms2) TRAM and DIEP flap were planned for breast reconstruction (Figure 2). After partial resection of the fourth rib, the internal mammary vessels (IMV) were dissected demonstrating a sufficient caliber and blood flow. Complete flap dissection was performed immediately before transplantation. After ligation of the inferior epigastric vessels, the flap was flushed with heparinized saline solution and the anastomosis performed. First, the DIEP flap was anastomosed to the left cranial IMVs. The venous anastomosis was performed with a Synovis 3.0-mm vein coupler (Synovis Micro Companies Alliance, Birmingham, AL, USA) and the arterial anastomosis was hand-sewn. After releasing the clamps the DIEP flap demonstrated a sufficient perfusion. Then the ms2-TRAM flap was connected to the right IMVs in the same manner. After finishing the anastomosis for the ms-TRAM flap, a venous congestion occurred in the DIEP-flap requiring revision. A venous thrombosis was found and the anastomosis renewed with a 2.5-mm vein coupler. Initial blood flow was good but after several minutes a venous thrombosis occurred again. We decided to revise the anastomosis using the caudal internal mammary vein. The venous anastomosis was hand-sewn using Ethilon 8-0. However, a venous thrombosis appeared again. On the basis of the left port vein thrombosis in the medical history we decided to perform the venous anastomosis with the right side caudal internal mammary vein. A small saphenous vein graft of 15 cm length was gathered, a subcutaneous presternal tunnel created and end-to-end anastomosis performed using two 2.5 mm vein couplers. Thereafter, a sufficient venous flow was evident and flap perfusion was excellent (Figure 3). As previously described, laser-assisted angiography was performed, indicating well-perfused free flaps (Buehrer, Taeger, Ludolph, Horch, & Beier, 2016; Ludolph et al., 2016). Postoperative prophylactic anticoagulation was performed with enoxaparin (40 mg 1-0-1, subcutaneously) and the patient was discharged from hospital after 10 days. No further complications were noted in the follow-up period (Figure 4).

3 | DISCUSSION

Multiple risk factors, such as radiotherapy, tamoxiften therapy and/or obesity, associated with flap thrombosis are discussed in the literature (Berry et al., 2010; Lee & Mun, 2016; McAllister, Teo, Chin, Makubate, & Alexander Munnoch, 2016; Parikh, Odom, Yu, Colditz, & Myckatyn, 2017). Although there might be a bias concerning the patient related risk factors (including radiotherapy and overweight [body mass index: 28.19 kg/m²]), we consider the left subclavian port-system thrombosis in the medical history as the primary reason for venous congestion. Venous insufficiency is the major reason for flap loss in unilateral as well as bilateral breast reconstruction (Rao, Parikh, Goldstein, & Nahabedian, 2010; Tran, Buchel, & Convery, 2007). Although a known thrombophilia and/or a subclavian vein thrombosis represent a relative contraindication, we selected this patient for autologous breast reconstruction using abdominal free flaps. The preoperatively performed thrombophilia screening with its inconspicuous results led to the assumption that the left subclavian port-system thrombosis might be a result of the hypercoagulable condition during chemotherapy (Haddad & Greeno, 2006). Despite an inconspicuous interval of 5 years, an additional duplex sonography

FIGURE 1 Computed tomography angiography of the abdomen revealing sufficient perforator vessels originating from the inferior epigastric vessels (labeled with stars)

FIGURE 2 Preoperative planning demonstrating breast reconstruction with a muscle sparing transverse rectus abdominis myocutaneous flap for the right side and a deep inferior epigastric artery perforator flap for the left side
could have provided guidance to altered flow conditions. In this context a further preoperative assessment of alternative recipient vessels would have been possible. Although manifold recipient vessels for autologous breast reconstruction are described in the literature, the subclavian port-system thrombosis and axilla dissection permitted the use of the ipsilateral thoracodorsal, cephalic, external jugular, lateral thoracic and circumflex scapular veins (Casey, Rebecca, Smith, Craft, & Buchel, 2007; Santanelli Di Pompeo, Longo, Sorotos, Pagnoni, & Laporta, 2015). In this case the contralateral caudal internal mammary vein has been the most obvious recipient vessel. After creating a subcutaneous presternal tunnel and harvesting a small saphenous vein graft we were able to reconstitute the venous drainage of the DIEP flap. As an ultima ratio the creation of an arteriovenous loop prior free flap surgery remains a further salvage procedure (Arkudas et al., 2018). The IMVs are preferred for autologous breast reconstruction due to their high flow rate (Saint-Cyr et al., 2007). In the pertinent literature the caudal internal mammary vein is described as a reliable recipient vessel for breast reconstruction, especially when the cranial vein is not available (Venturi, Poh, Chevray, & Hanasono, 2011). Furthermore, some authors prefer the caudal and cranial internal mammary vein in
order to supercharge the venous drainage (Al-Dhamin, Bissell, Prasad, & Morris, 2014; La Padula et al., 2016). Regarding the use of the contralateral IMVs in simultaneous breast reconstruction several case reports exist with auspicious results (Kosutic & Lambe, 2018; Lee, Varon, & Halvorson, 2017). In this context, not only anatomical variants causing vessel depletion but also patients after coronary bypass surgery using the left mammary artery are possible candidates for the contralateral caudal IMVs. Taken together, a subclavian port-system thrombosis in the patient history can be associated with a risk of venous congestion in autologous breast reconstruction. In this regard a rigorous preoperative assessment including a thrombophilia screening and/or duplex sonography is indispensable. However, in case of venous congestion of the internal mammary and/or subclavian vein, it is important to bear in mind alternative recipient vessels. To date this is the first case report describing a successful salvage procedure using a venous cross-over bypass to the contralateral caudal mammary vein due to insufficient venous flow of the ipsilateral internal mammary vein.

CONFLICT OF INTEREST

None.

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