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Sickle Cell and Reduction Mammoplasty: A Case Report and Algorithmic Approach

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Abstract

Sickle cell presents a challenge to the plastic surgeon as it adversely affects blood flow in patients carrying both the trait and disease. Unfortunately, despite its prevalence, there is a paucity of literature detailing the management sickle cell in the context of breast surgery, particularly breast reductions. We present a case of a patient with sickle cell disease who underwent bilateral reduction mammoplasty and suggest an algorithm for the perioperative management of patients with sickle cell based on a comprehensive review of the literature. We describe preoperative, intraoperative, and postoperative measures to limit complications.

Introduction

Sickle cell disease (SCD) affects nearly 100,000 Americans and is particularly prevalent in the African American population, with approximately 1 in 12 carrying the sickle cell trait (SCT) [1]. This inherited hemoglobin disorder disrupts the erythrocytes's oxygen-carrying capacity, lowers oxygen tension, and results in microvascular vasocclusion when the cells sickle in low oxygen states. Erythrocyte sickling occurs in under conditions of acidosis, dehydration, and hypothermia as well. Microinfarction, ischemic tissue pain, and organ malfunction may then ensue. The stress of surgery may induce such low oxygen states. Perioperative management of patients with sickle cell has previously been described and is focused primarily on pre/intra-transfusions to reduce red blood cell sickling and complications [2-5]. Unfortunately, despite its prevalence, there is a paucity of literature describing sickle cell in the context of breast surgery, particularly breast reductions, and strategies to prevent associated complications. We present a case report of a patient with SCD who underwent bilateral reduction mammaplasty and subsequently developed skin and underlying soft tissue necrosis. We suggest an algorithm for the perioperative management of patients with SCD/SCT based on a comprehensive review of the literature.

Case Report

A 38 year-old African American female with SCD requiring numerous hospital admissions for episodes of acute chest syndrome, presented in sickle cell crisis and was admitted to a medicine service. Two weeks prior to presentation, she underwent a bilateral breast reduction mammaplasty for symptomatic macromastia. Intraoperative details concerning the reduction technique, breast volume removed, and overlying skin flap thickness are unknown as her reduction was completed at an outside facility. Her post-operative course was complicated by breakdown along the vertical and inframammary fold-aspects of her incisions that initially started as epidermolysis by three days postoperatively, and progressed to skin flap necrosis, drainage, and eschar formation [Figure 1]. Our Plastic Surgery team was consulted to evaluate her surgical site. The patient's sickle cell crisis was treated with intrave-nous fluids and narcotic pain medications. Her hemoglobin dropped from 10.1 to 9.1 g/dL and subsequently remained stable. The wounds were treated conservatively with topical silvadene and a silicone-based dressing. The sites ultimately healed although in a delayed fashion.

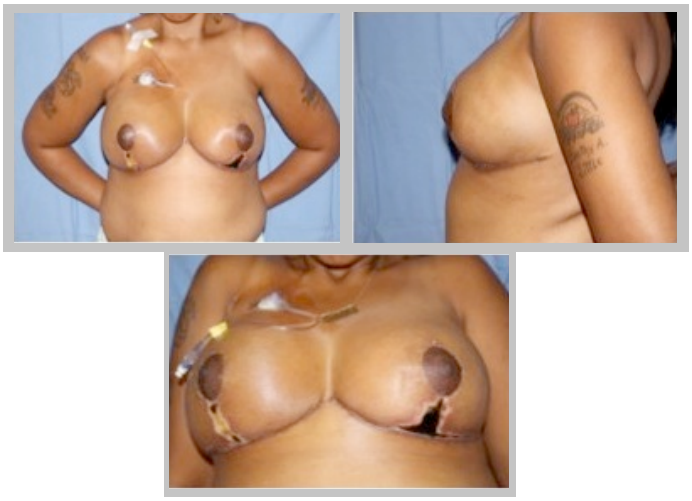

Figure 1: Anterior, lateral, and modified anterior views of a patient with sickle cell disease (SCD) status post bilateral breast reduction. Note the areas of necrosis and eschar formation along the vertical and inframammary fold incisions. Also note the subcutaneous venous access port, present for her SCD treatment. This alludes to the severity of her SCD.

Discussion

On a macroscopic level, the breast receives blood from perforating branches of the internal mammary, lateral thoracic, thoracoacromial, and posterior intercostal arteries. These vessels supply blood to both the breast gland and the overlying skin via dermal and subdermal

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and posterior intercostal arteries. These vessels supply blood to both the breast gland and the overlying skin via dermal and subdermal plexuses. Microcirculation in the breast can be compromised in patients with blood dyscrasias, such as SCD/SCT, via vasocclusion, particularly when hypoxia is induced during dissection and undermining in breast surgery. This impairment of microcirculation can ultimately lead to skin and underlying soft tissue necrosis. This phenomenon has been previously described in patients with sickle cell in the context of leg ulcers; minor trauma leads to an inflammatory response, which creates a cycle of tissue hypoxia and sickling of erythrocytes, and ultimately results in a wound [6-8]. It can be hypothesized that the trauma of breast surgery creates a similar environment of inflammation and hypoxia.

In a correspondence in 2003, Spear et al. present a patient with SCT who underwent a bilateral reduction mammoplasty complicated by epidermolysis and necrosis [9]. It was hypothesized that her SCT compromised microvascular circulation to the skin flaps of the breasts despite perceived adequate flap thickness. This suggests that even less severe forms of SCD should be considered risk factors for skin flap necrosis in addition to smoking, obesity, radiation, diabetes, and previous chest/breast surgery. Spear et al. advocate for close observation, limited undermining, minimizing vasoconstrictors and a low threshold for hyperbaric oxygen treatment if the patient develops signs of ischemia.

In 2009, the American Society of Plastic Surgeons Patient Safety Committee released a practice advisory for managing patients with blood dyscrasias undergoing elective plastic surgery [10]. They recommend consultation by a hematologist, performing outpatient procedures in the inpatient setting, correcting anemia by transfusion, adequately maintaining hydration and oxygenation, monitoring acid-base status, and preferentially selecting less aggressive surgical procedures when possible. While these recommendations do not specifically address scenarios of SCD/SCT, they may be extrapolated.

Patients under consideration for elective breast surgery should undergo a routine history and physical examination, including inquiry of personal or family history of bleeding (postsurgical, epistaxis, gingival), bruising, thrombosis, and menorrhagia. Suspicion for an undiagnosed blood dyscrasia or hemoglobinopathy may be confirmed after laboratory work with subsequentreferral to a hematologist prior to surgery.

Because many patients with hemoglobinopathies have lower baseline hemoglobin or dysfunctional erythrocytes as compared to those without such disorders, preoperative transfusions are often considered. Unfortunately, this practice is controversial in patients with SCD/SCT; some studies have demonstrated a decrease in intra and post-operative complications (e.g. pain, acute coronary syndrome, stroke, infection, fever, bleeding, thrombosis, embolism, and death), while others have not [2-5, 11]. In an older report of a successful transverse rectus abdominis muscle flap for breast reconstruction in a patient with SCD, Hawes and Carlson suggest exchange transfusion to reduce the level of hemoglobin S to less than 30% [12]. Transfusions are not without risks, however, which may include increased blood viscosity, hepatopathy/iron overload, and infection. It is therefore unclear if the benefit of reducing potential vasocclusive or ischemic complications outweighs the risk of transfusion-related complications and transfusion, whether simple or exchange, should be discussed preoperatively with a specialist.

Maintaining adequate intravascular volume with perioperative intravenous fluids, preoxygenation before induction and close monitoring of intraoperative oxygenation saturation, preoperative promethazine, and maintaining the patient's body temperature within a normal range, may also reduce the likelihood of complications related to erythrocyte sickling while not without incredible risk [13, 14].

Modifying one's surgical technique may also reduce the likelihood of complications. In a continuing medical education article in 2010, Hammond and Loffredo emphasize limited undermining and leaving a wider pedicle to reduce the likelihood of ischemia or necrosis in patients with prior breast reduction or irradiation [15]. While there may not be an ideal pedicle thickness or reduction pattern that applies to all patients with SCD/SCT, a more conservative approach with less aggressive removal of breast tissue and a smaller reduction would be better tolerated.

There may be a role for nitroglycerin ointment in at-risk patients with SCD/SCT. Gdalevitch et al. demonstrate improved mastectomy skin flap survival after applying nitroglycerin ointment immediately post-operatively [16].

Hyperbaric oxygenation may reduce or slow the progression of skin or soft tissue necrosis in patients with early signs of this complication. In 1962, Laszlo et al. demonstrated hyperbaric oxygenation at 2 ATM to deliver oxygen to tissue reduced circulating sickle cells [17]. Not long after, Reynolds provided a case report of a patient with sickle cell crisis successfully treated with hyperbaric oxygen [18]. While this may not be a readily available option for some patients, for those in proximity to a hyperbaric chamber, it may be a useful salvage option.

Hemoglobinopathies or blood dyscrasias, such as SCD, have yet to be widely recognized as risk factors for breast skin flap necrosis and no studies have specifically addressed SCD as it relates to elective, breast surgery [16]. Until large, clinical trials and studies can supplement current guidelines, we propose the algorithm depicted in [Figure 2].

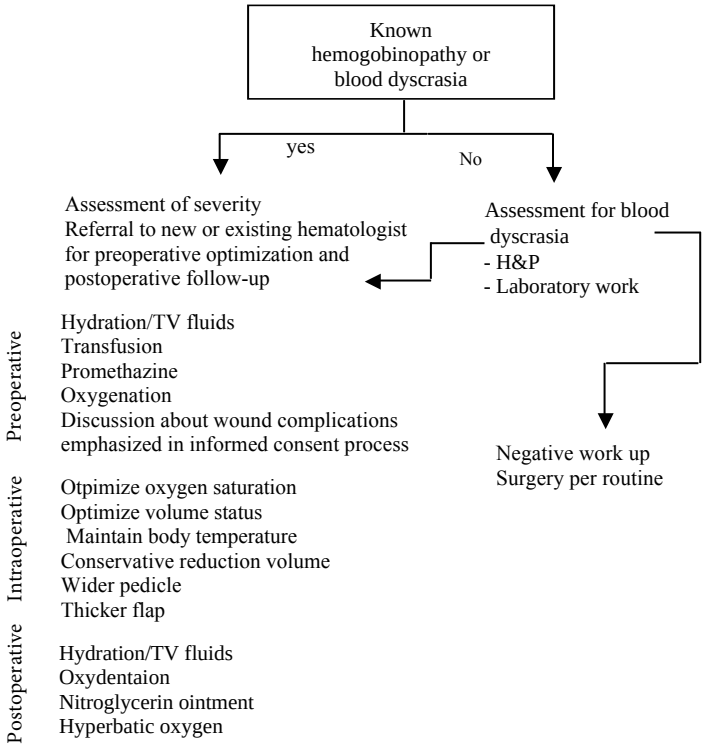

Figure 2: Suggested algorithm for the management of a patient with SCD/SCT undergoing breast surgery.

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Conflicts of Interest and Source of Funding

None declared