Inadequate tissue perfusion is a serious complication following reconstructive surgeries. Skin flap necrosis, especially in the head and neck area, may have significant cosmetic consequences. Although clinical exam is the mainstay in evaluating perfusion, it may not always predict ischemic problems. The SPY Elite laser angiographic system, which has been widely used to analyze tissue perfusion in postmastectomy skin flaps, has been shown to be able to evaluate tissue perfusion objectively. We describe a revision rhinoplasty case where hypoperfusion of the nasal tip was seen following placement of structural grafts to the nasal tip, and before the grafts being removed SPY angiography was used to evaluate if topical nitroglycerin alone could correct hypoperfusion of the nasal tip rather than removal of structural grafts. A SPY angiography was performed to evaluate the hypoperfusion to the nasal tip. Repeat imaging was then performed following treatment with topical nitroglycerin alone. Perfusion of the nasal tip was restored and confirmed by SPY angiography system. The objective findings from the SPY angiography allowed the grafts to remain in place and lead to optimal cosmetic result. Due to the critical information SPY angiography provided in this case, we recommend the use of technology when evaluating reconstructive cases in which the viability of the tissue may be difficult to deduce from clinical exam. (Plast Reconstr Surg Glob Open 2019;7:e2123; doi: 10.1097/GOX.0000000000002123; Published online 28 June 2019.)

Summary: Inadequate tissue perfusion is a serious complication following reconstructive surgeries. Skin flap necrosis, especially in the head and neck area, may have significant cosmetic consequences. Although clinical exam is the mainstay in evaluating perfusion, it may not always predict ischemic problems. The SPY Elite laser angiographic system, which has been widely used to analyze tissue perfusion in postmastectomy skin flaps, has been shown to be able to evaluate tissue perfusion objectively. We describe a revision rhinoplasty case where hypoperfusion of the nasal tip was seen following placement of structural grafts to the nasal tip, and before the grafts being removed SPY angiography was used to evaluate if topical nitroglycerin alone could correct hypoperfusion of the nasal tip rather than removal of structural grafts. A SPY angiography was performed to evaluate the hypoperfusion to the nasal tip. Repeat imaging was then performed following treatment with topical nitroglycerin alone. Perfusion of the nasal tip was restored and confirmed by SPY angiography system. The objective findings from the SPY angiography allowed the grafts to remain in place and lead to optimal cosmetic result. Due to the critical information SPY angiography provided in this case, we recommend the use of technology when evaluating reconstructive cases in which the viability of the tissue may be difficult to deduce from clinical exam. (Plast Reconstr Surg Glob Open 2019;7:e2123; doi: 10.1097/GOX.0000000000002123; Published online 28 June 2019.)

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plasty with use of costal cartilage for grafts. After reelevation of nasal skin and soft tissue, bilateral extended spreader grafts and a columnellar strut were placed. Intradomal and transdomal tip modifying sutures were performed. There were no complications or major bleeding during the surgery and no artery was clipped. The skin was redraped over the nasal skeleton only to find a bluish color to the nasal tip and columnella implicating tissue congestion (Fig. 1).

Intraoperative SPY imaging was performed confirming hypoperfusion. While in the operating room and before removing grafts, topical nitroglycerin was placed over the areas with perfusion of 20% or less. Twenty minutes later, repeated SPY imaging demonstrated adequate perfusion making it unnecessary to carve down tip grafts to decrease tension on the nasal skin at the expense of providing an optimal aesthetic result (Fig. 2). Topical nitroglycerin was continued for twice a day for 5 days and the nasal tip skin was fully viable 10 days postoperatively.

**DISCUSSION**

Skin necrosis can be catastrophic complication in rhinoplasty. The use of SPY angiography in this case lead to a more informed decision, which prevented the patient from undergoing an additional unnecessary procedure.

The SPY Elite laser angiographic system targets the unique chemical feature of ICG. ICG was first described in 1957 and received FDA approval in 1959. The technology has been applied in reconstructive surgeries over the last decade. ICG is a contrast with minimal adverse reaction (approximate rate is 1 in 42,000 patients) even after multiple injections. This fluorescent dye is administered intravenously or intra-arterially, immediately binds to plasma proteins, and remains in circulation with minimal interstitial leakage. Maximum fluorescent effect occurs in near-infrared wavelengths, which penetrates the skin to visualize deep dermis and subcutaneous vasculature. ICG has a short half-life of 150–180 seconds making it suitable for multiple objective evaluation during the surgery. This information identifies ischemic complications and assists in the decision-making process as to when to take the patient back to the operating room versus planning for bedside pharmacologic interventions or even leech therapy. Nitroglycerin paste has a rapid dilatory effect on both arteries and veins and can be used to reestablish tissue perfusion. It has already been used to manage flap ischemia in surgeries.

This case describes the application of topical nitroglycerin to salvage a hypoperfused nasal tip. SPY angiography changed the treatment plan of this patient, as the normal

Fig. 1. A, During the surgery, the nasal tip begins to turn a bluish hue. B, Ischemia and hypoperfusion are confirmed by SPY angiography. Topical nitroglycerin was applied to the skin area of lower than 20% perfusion.

Fig. 2. A, Topical nitroglycerin was applied to hypoperfused area before removing the grafts. B, Repeat SPY angiography revealed adequate perfusion, enough to save the grafts.
algorithm for tissue ischemia, in this setting, would be trimming or removing grafts in the hope of decreasing tension on the distal aspects of the skin and allowing for increased perfusion. This use of SPY angiography assisted the surgeons in evaluating the immediate effect of topical nitroglycerin. In this case, topical nitroglycerin was effective in alleviating the hypoperfusion and the use of SPY angiography in evaluating the nasal tip prevented the patient from removing the grafts or additional unnecessary surgeries and general anesthesia.

Nowadays, SPY angiography is available in most of the major facilities. In this recent case, the charges were covered by insurance. However, in cosmetic cases, the cost would come out of the facility fee or the surgeon’s fee which is low and extremely effective compared to the terrible outcome of nasal tip necrosis.

Based on the results of this case, cases involving secondary cleft rhinoplasty or multiple revision nasal surgery may benefit from SPY angiography to evaluate tissue perfusion in real time. Tenuous vasculature from multiple nasal surgeries can result in full tip necrosis during revision cases. The use of SPY angiography can assist surgeons in preoperative, intraoperative, and postoperative planning to minimize complications and risks.

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