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Background

As breast reconstructive microsurgeons increase their armamentarium of flaps with experience, stacked and multiple flaps may generate an improved aesthetic outcome. Bi-pedicled and stacked flaps have been performed by microsurgeons using the cranial and caudal internal mammary system. We present our experience utilizing this system for flap reliability.

Total Flap Loss Rate	1.4%
Flap Loss Avoidance	2.7% (6 flaps)

Figure 1. Flap loss and loss avoidance rates

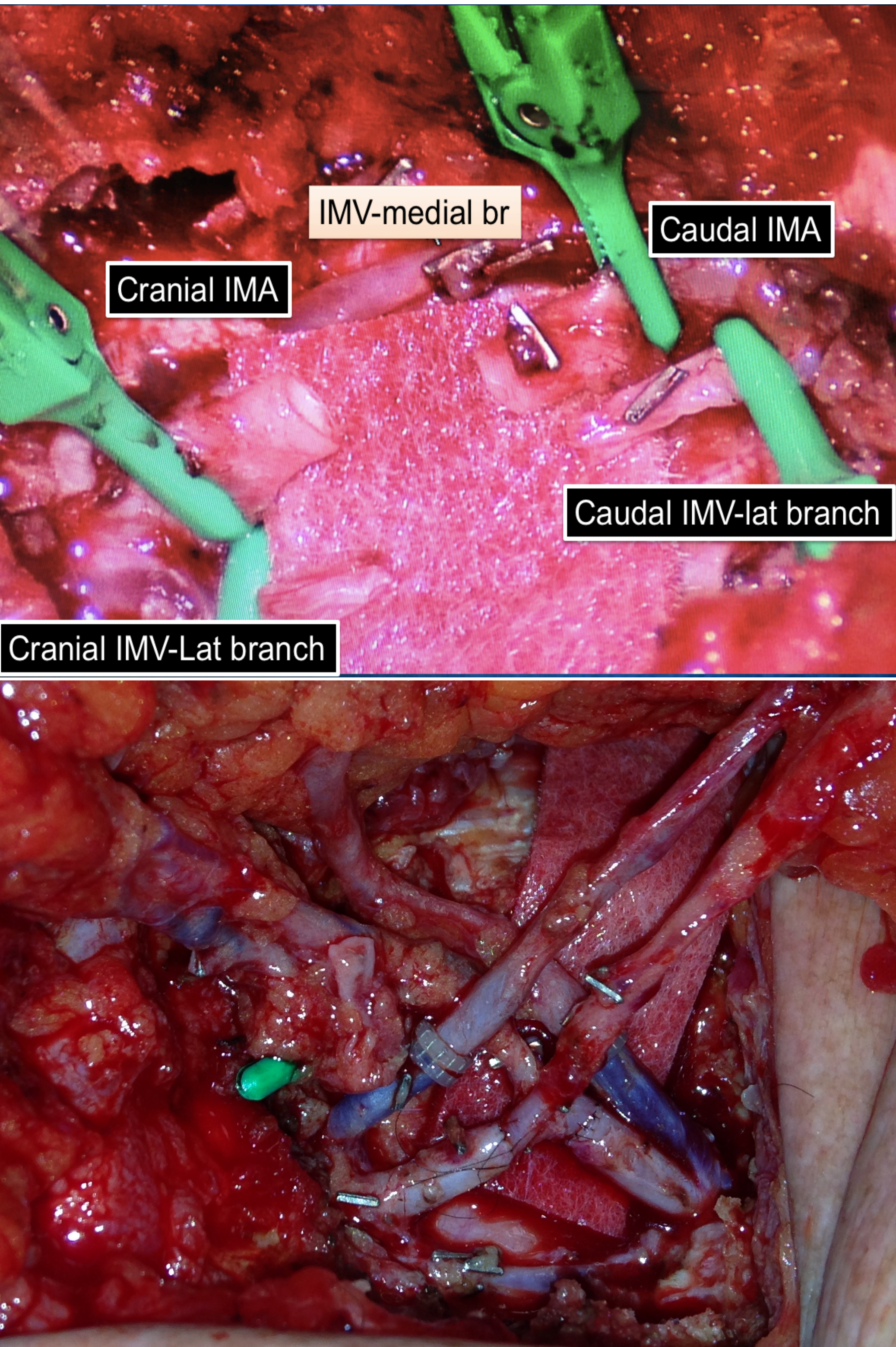


Figure 2. Before and after: complete cranial and caudal anastomosis

Results

454 anastomosis were performed in 87 patients who underwent 220 flaps (Double-pedicle deep inferior epigastric perforator (DIEP) flaps, 4-Flap, Stacked profunda artery perforator (PAP) flaps). Out of 454 anastomosis, 167 were to Caudal internal mammary artery/vein (IMA/V) (37%), 171 were to Cranial IMA/V (38%), and 116 were intra-flap (25%).

There were 0 flap losses in Double-pedicle DIEP group (58-patients, 116-flaps), 3 flap losses in 4-Flap group (23-patients, 92-flaps), and 0 in Stacked-PAP group (6-patients, 12-flaps). In the 3 flap losses of 4-Flap group, 2 flaps were to Caudal IMA/V (1 arterial thrombosis, 1 venous thrombosis), and 1 cranial IMA/V (venous thrombosis). Also, in the 4-Flap group, 3 flaps were salvaged by converting to intra-flap anastomosis (6 anastomosis) due to intraoperative thrombosis of Caudal IMA/V (all 3 had arterial thrombosis related to caudal IMA). In the Stacked-PAP group, there were 2 flaps salvaged, 1 by converting to intra-flap artery from caudal IMA, and other was venous congestion from caudal IMV pedicle kink seen post-operative day one. In the Double-pedicle DIEP group, 1 flap was salvaged by converting 1 arterial anastomosis from caudal IMA to intra-flap.

Total flap loss rate in entire group was 1.4%. Flap loss avoidance (or net increase in flap success) by either conversion to intra-flap anastomosis or early suspicion of caudal system compromise was 2.7% (6 flaps prevented out of 220).

Methods

736 flaps for breast reconstruction were performed from 2010-2016 (DIEP/SIEA and PAP flaps) by 2 senior surgeons at a university hospital. 220 (30%) of those flaps were either: Stacked PAP flaps, 4-flap (Bilateral PAP+DIEP flap), or Double-pedicle DIEP/SIEA flaps. Specific data regarding number, type, and locality of anastomosis was analyzed.

Type	Losses	Salvaged
Double Pedicle DIEP	0	0
4-Flap	3 (2 caudal, 1 cranial)	3 (caudal thrombosis)
Stacked PAP	0	2

Figure 3. Flap loss and salvage counts

Conclusion

Caudal IMA/V system remains a viable and safe option for anastomosis in multiple flap procedures. However, based on our large experience with stacked and multiple flaps, we add caution utilizing the caudal system, particularly in patients with radiation, anastomosis mismatch and intraoperative spasm. The enthusiasm towards usage of caudal IMA/V system should be appropriately attenuated in certain circumstances with preference towards intra-flap anastomosis.



Figure 4. Pre-operative photo



Figure 5. Post-operative photo