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Reversible No-Reflow Phenomenon in a Free Flap after 16 Hours

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A patent vascular tree within the flap and anastomosis are quintessential for the success of a microvascular free flap. Any thrombus or vasoconstriction severely affects the blood flow in the flap. Intraoperative ischemia time also plays a major role in the flap. Various clinical and objective methods have been designed that help in the postoperative monitoring and timely intervention to reverse an impending free flap failure by identifying the cause. Here, we discuss an interesting scenario about a free flap showing signs of flap failure (clinical and objective) during the immediate postoperative period up to 16 hours, but later on survived completely without active intervention.

A 30-year-old woman with no comorbidities presented with an exposed titanium cranial implant in the right parietal region for 4 months (►**Fig. 1**). The implant was removed and the defect was covered with a free anterolateral thigh flap (12 × 10 cm) with a single musculocutaneous perforator. The artery and vein of the free flap were anastomosed to the facial artery and a tributary of the internal jugular vein, respectively. Ischemia time was 45 minutes. Immediately following anastomoses, the flap color was pale, Doppler signal was absent over the perforators, and there was no satisfactory dermal bleed on scratch. However, there was intact antegrade flow across the arterial and venous anastomosis. Intraoperative indocyanine green dye study showed minimum blood flow around the perforator entry site to the flap with lack of uptake in the surrounding flap (►**Fig. 2**). The blood pressure and temperature of the patient were within the normal range throughout the procedure and afterward. No anticoagulants were administered.

The patient was monitored hourly in the post-op period (►**Fig. 3**). Since the flap was pale with no bleed on scratch

Fig. 1 Defect after the removal of the implant.

with absent Doppler signals, we explored the flap at 3 hours postoperatively. Both arterial and venous anastomoses were patent. The flap was kept warm, and the vitals were well maintained. Even after that, the flap was pale with no bleed on scratch for the next 13 hours. But surprisingly, scratch bleed and Doppler signal over the perforator gradually reappeared after 16 hours. We had not performed any active intervention during this period (►**Fig. 4**).

The reason for reversible signs of flap failure can be the "reversible no-reflow phenomenon." The obstruction to blood flow in peripheral tissues due to various periods of ischemia, despite patent anastomosis, has been studied

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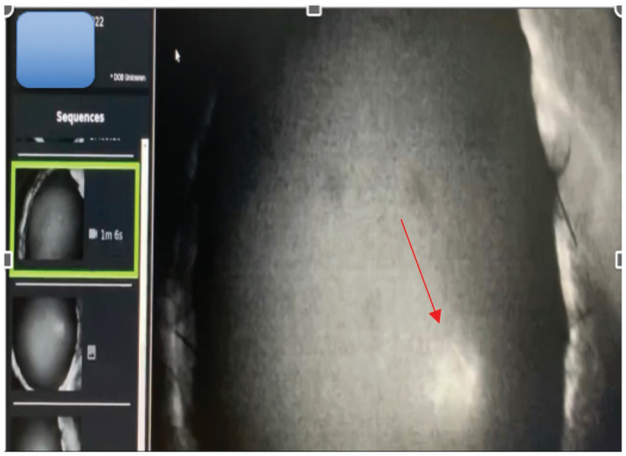

Fig. 2 Immediate post-op indocyanine green (ICG) study showed poor dye uptake in flap excerpt for perforator entry site.

Fig. 4 Follow-up at 3 months.

experimentally and termed the "no-reflow phenomenon" by Ames et al.[1] According to the study by May et al,[2] the no-reflow phenomenon is due to (1) edema and swelling of the vascular parenchymal cells and (2) thrombus within the vascular tree.

If the blood supply to the flap is obstructed for less than 4 hours (maximum up to 12 hours in few cases), then the no-reflow phenomenon is reversible. If the blood flow can be established and maintained to the ischemic tissue within this period, then the peripheral resistance of the tissue will fall, the flow to the periphery will increase, and the thrombogenic danger to the vascular tree and anastomosis will abate.[2] This exact situation might have happened to our flap, which showed initial signs of failure during the immediate postoperative period probably due to increased peripheral resistance or thrombus within the vascular tree. Since the ischemia time was less than 1 hour and a good venous outflow was maintained all along the postoperative period, the no-reflow cycle broke and the flow to the peripheral tissue increased after 16 hours. The free flap survived and miraculously healed without complications.

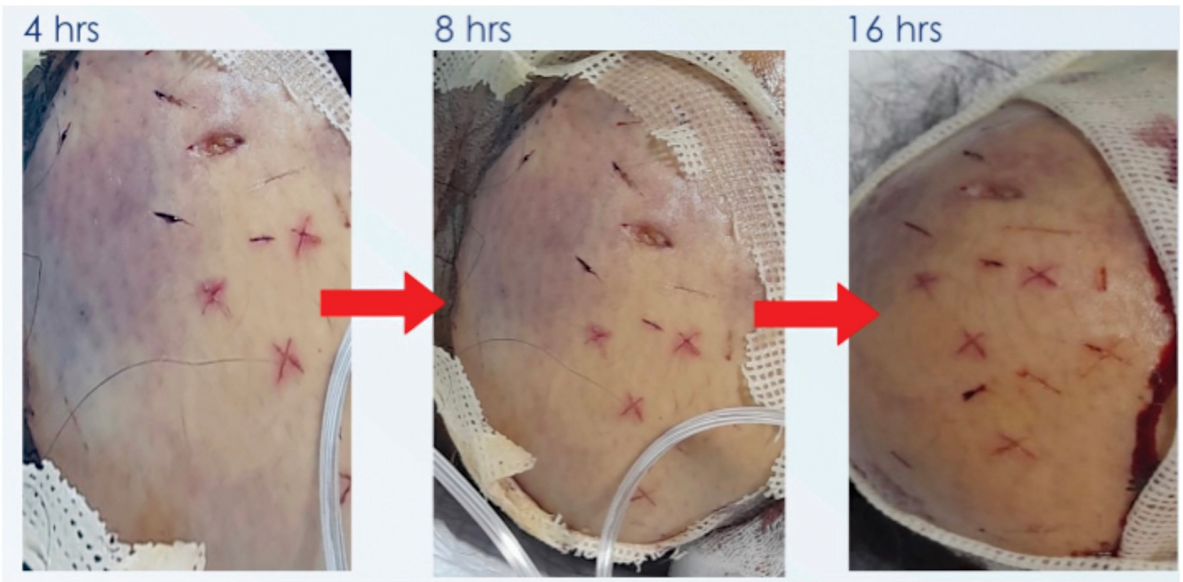

Fig. 3 Flap progression at 4, 8, and 16 hours.

After extensive search, we could not find any clinical case reports in the literature showing "reversible no-reflow phenomenon" even after 16 hours in a free flap reconstruction.

Conflict of Interest
None declared.

References

1 Ames A III, Wright RL, Kowada M, Thurston JM, Majno G. Cerebral ischemia. II. The no-reflow phenomenon. Am J Pathol 1968;52 (02):437–453
2 May JW Jr, Chait LA, O'Brien BM, Hurley JV. The no-reflow phenomenon in experimental free flaps. Plast Reconstr Surg 1978;61(02):256–267

