# A cut above the rest:

## A novel surgical technique for the reconstruction of large eyelid defects

*On November 24, 2023, Kajsa Tenland defended her thesis, "Reconstruction of large eyelid defects using tarsoconjunctival flaps—opportunities for novel surgical techniques," at Lund University, Department of Ophthalmology, Clinical Sciences Lund. The main supervisor was Malin Malmsjö, M.D., Ph.D., Department of Clinical Sciences, Skåne University Hospital, Lund University, with co-supervisors Karl Engelsberg, M.D., Ph.D., and Sandra Lindstedt, M.D., Ph.D., Department of Clinical Sciences, Skåne University Hospital, Lund University.*

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Skin tumors, such as basal cell carcinomas, are common in areas exposed to the sun, such as the eyelids. The complex anatomy of the eyelids protects the eye from the outside world and keeps the sensitive cornea lubricated. This presents a reconstructive challenge in maintaining function and stability.

Large lower eyelid defects resulting from tumor removal are frequently reconstructed using a tarsoconjunctival flap from the upper eyelid combined with an overlying free full-thickness skin graft. A major disadvantage of this technique is that the tarsoconjunctival flap occludes the eye during graft revascularization, which is particularly troublesome for patients with poor vision in the other eye. However, previous studies have raised the questions of whether the flap contributes to perfusion in the graft and whether a single-stage procedure using free full-thickness composite grafts could be a surgical option.

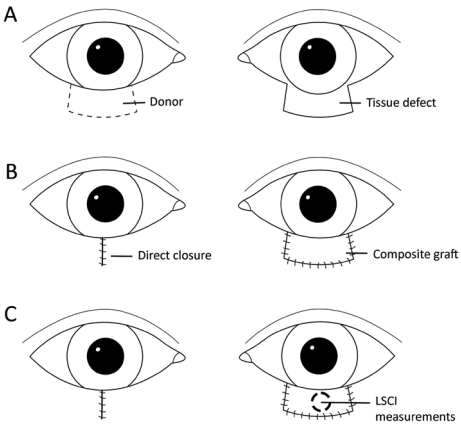


*Figure 1. Surgical procedure of composite grafts. The full-thickness, bilamellar eyelid grafts were harvested from the opposing or ipsilateral eyelid (A) and sutured into the tissue defect (B). The donor site was repaired with direct closure. The blood perfusion was measured during surgery and during the healing process (C). Illustration by Jenny Hult.*

Modern techniques permit monitoring blood perfusion during and after surgery, safely, objectively, and non-invasively, with no negative effects on the patient. This allows us to evaluate and optimize surgical methods and question old truths based mainly on empirical knowledge. Microvascular perfusion and oxygenation were studied in patients and a porcine model undergoing reconstructive surgery of large lower eyelid defects, using laser speckle contrast imaging, laser Doppler velocimetry, and a Clark electrode.

Perfusion was monitored in the tarsoconjunctival flaps of patients during surgery. It decreased gradually along the length of the flap, with almost no blood flow at its distal end. Perfusion was then monitored in the free skin grafts overlying the tarsoconjunctival flaps during healing. Despite the minimal perfusion in the flaps, the free grafts overlying them were reperfused within the first 3–8 weeks postoperatively. These findings support the hypothesis that the free graft does not depend on a vascularized pedicle for survival.

The perfusion of free full-thickness autologous composite grafts used to repair large eyelid defects was monitored in patients during and after surgery, showing that all grafts were reperfused within the first 8 weeks postoperatively. All grafts survived and healed well. No signs of tissue necrosis occurred.

We also studied the impact of cantholysis, often necessary during reconstruction to mobilize and reduce stretching of the tissue, on blood perfusion. Canthotomy and wedge resection were performed in pigs, and blood perfusion and oxygenation were monitored perioperatively. Canthotomy resulted in a decrease in blood perfusion of the remaining eyelid. This may affect healing, especially when using a free full-thickness composite graft for the repair.

In conclusion, the avascular free full-thickness grafts did not seem to be dependent on a vascularized flap. A single-stage graft using a free eyelid composite graft may be used as an alternative in selected patients. A free composite graft would be considerably advantageous to patients since the occlusion of vision post-surgery could be avoided and the number of procedures reduced.

***Key points:***

- A tarsoconjunctival flap does not significantly contribute to the perfusion of the reconstructed eyelid.
- A single-step surgical technique using free composite grafts to repair large eyelid defects in selected cases may be a good, even preferable, alternative to a two-step procedure.

***Future directions:***

- Further studies should be carried out on composite grafts with larger samples of patients, longer follow-ups, and postoperative tear film evaluation.
- Promising new techniques being developed are suitable for monitoring perfusion and oxygenation during and after reconstructive surgery, such as hyperspectral imaging (HSI), which measures oxygenation non-invasively with good spatial resolution.

***References***

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