

Use of an Anastomotic Venous Coupler Device for Radial Forearm Free Flap Reconstruction Following Tongue Cancer Resection: A Case Report

Wirut Iamsahakiat M.D., Thanarath Imsuwansri M.D., Ekapob Sangariyavanich M.D.

Ear Nose Throat Department, National Cancer Institute 268/1 Rama VI Road, Thung Phaya Thai, Ratchathewi, Bangkok 10400

Corresponding Author: Wirut Iamsahakiat (Email: doctorwirut@gmail.com)

(Received: 4 September, 2026; Revised: 5 October, 2026; Accepted: 5 October, 2026)

Abstract The anastomotic coupler is a microsurgical device for venous anastomosis in free tissue transfer. International literature has confirmed that it shortens anastomosis time, lowers thrombosis rates. We report a 60-year-old Thai woman with squamous cell carcinoma of the left lateral tongue, stage pT3N3bM0 (Stage IVB), who underwent left hemiglossectomy with left modified neck dissection and reconstruction with a radial forearm free flap. The arterial anastomosis was performed using a hand-sewn microsurgical technique, while the single venous anastomosis was performed to the facial vein using an anastomotic coupler device. The flap remained fully viable with no vascular complications throughout follow-up, including through postoperative concurrent chemoradiotherapy. This outcome is consistent with the safety profile reported abroad and represents the first documented use of this technology in a head and neck free flap within the Thai Ministry of Public Health system. (*Thai Cancer J* 2026;46:142–152)

Keywords: anastomotic coupler, venous coupler, free flap, radial forearm free flap, tongue cancer, head and neck reconstruction

Introduction

In Thailand, head and neck cancer ranks among the top five most prevalent cancer groups, with an age-standardized rate (ASR) approaching 15.7 per 100,000 males and 10.7 per 100,000 females. Within this group, oral cavity cancer is the most common site in men and the second most common in women after thyroid carcinoma, and it carries the highest mortality of any head and neck subsite in the country. Over the past three decades the pattern of disease has shifted: carcinoma of the buccal mucosa, historically linked to betel quid chewing, has declined, while tongue cancer, more closely associated with tobacco and alcohol use, has become proportionally more common¹. Reported five-year survival for oral cancer

in Thailand remains modest, and outcomes are consistently worse for tongue primaries than for other oral subsites¹, underscoring both the clinical burden of this disease and the importance of reconstructive quality once ablative treatment is complete.

Most patients with locally advanced oral tongue cancer require resection of the primary tumor together with neck dissection, leaving a defect that directly affects speech, swallowing, and quality of life. Reconstruction with free tissue transfer has therefore become almost standard alongside ablative surgery, allowing the surgeon to restore both bulk and mobility rather than relying on primary closure or a pedicled flap that often leaves the tongue tethered. The radial forearm free flap (RFFF) has long served as the workhorse for tongue and floor-of-mouth reconstruction: it is thin, highly pliable, resurfaces three-dimensional defects well, and its pedicle — the radial vessels together with the venae comitantes and, usually, the cephalic vein — is long and of a caliber that matches the recipient vessels of the neck comfortably.

Within that operation, the most difficult and time-consuming step remains the microvascular anastomosis, on which flap survival ultimately depends. The traditional technique, hand-sewn stitch by stitch under the operating microscope, demands considerable skill and time, and even in experienced hands the venous anastomosis is disproportionately responsible for flap failure, since sluggish venous outflow is far more likely to progress silently to thrombosis than an arterial inflow problem, which tends to declare itself immediately. The anastomotic coupler was devised specifically to make this step faster and more consistent. The concept originated with Nakayama in 1962 and has since been refined into a device now standard at many high-volume centers worldwide. Its principle is mechanical rather than suture-based: both vessel ends are everted and secured onto a pair of interlocking rings studded with fine pins, so that the two cut edges meet intima-to-intima around their full circumference in a single motion. This removes the variability of hand suturing, eliminates the risk of catching the back wall, and — because the anastomosis itself takes only a few minutes — meaningfully shortens the total ischemia time the flap must tolerate.

Large international datasets report success rates for coupled venous anastomosis in head and neck surgery as high as 94.9-97.7%^{2,3}, and coupler models incorporating micro-Doppler probes further allow continuous postoperative flap monitoring⁴. Despite this accumulated evidence and the technology's spread through high-income centers, a search of Thai literature published within the Ministry of Public Health system revealed essentially no reports of clinical use in head and neck reconstruction. We therefore present our experience

using a coupler for venous anastomosis in an RFFF reconstruction following tongue cancer resection. This is the first published case report describing the use of a venous anastomotic coupler for head and neck free-flap reconstruction in a Thai Ministry of Public Health Institution, at the National Cancer Institute.

Case Presentation

A 60-year-old Thai woman with a history of type 2 diabetes mellitus, hypertension, and dyslipidemia with no family history of malignancy and no prior surgery, presented with a left lateral tongue ulcer of approximately two months' duration. The lesion was non-bleeding and oral intake remained preserved. Intraoral examination revealed a 3x3 cm ulcerative mass of the left lateral tongue extending to the midline and floor of mouth.

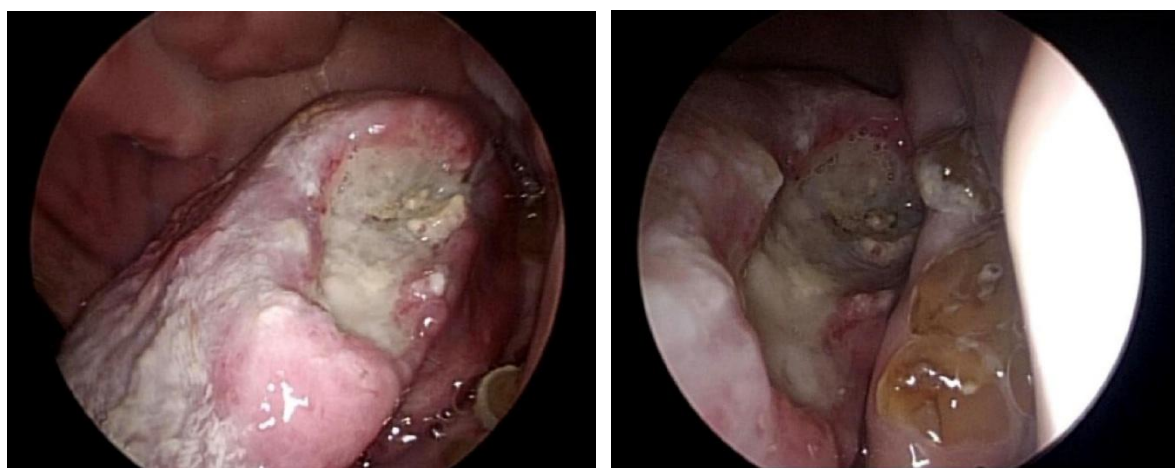


Figure 1 Preoperative intraoral endoscopic view showing an exophytic/papillary ulcerative mass of the left lateral tongue extending toward the midline and floor of mouth.

Incisional biopsy showed a spindle cell neoplasm, highly suspicious for spindle cell squamous cell carcinoma. computed tomography scan (CT Scan) of the oral cavity demonstrated a left lateral tongue mass invading the left hyoglossus muscle and left lateral tongue base, measuring 3.8x1.4x2.5 cm, with enlarged left level I-II neck nodes measuring 0.9-1.0 cm.

The patient underwent left hemiglossectomy with left modified neck dissection (level I-V) with reconstruction using a radial forearm free flap, with a split-thickness skin graft (STSG) used to close the forearm donor site. The arterial anastomosis was hand-sewn to the facial artery, while the single venous anastomosis was performed to the facial vein using an anastomotic coupler device Figure 2 shows the operative field immediately after completion of the coupled anastomosis.

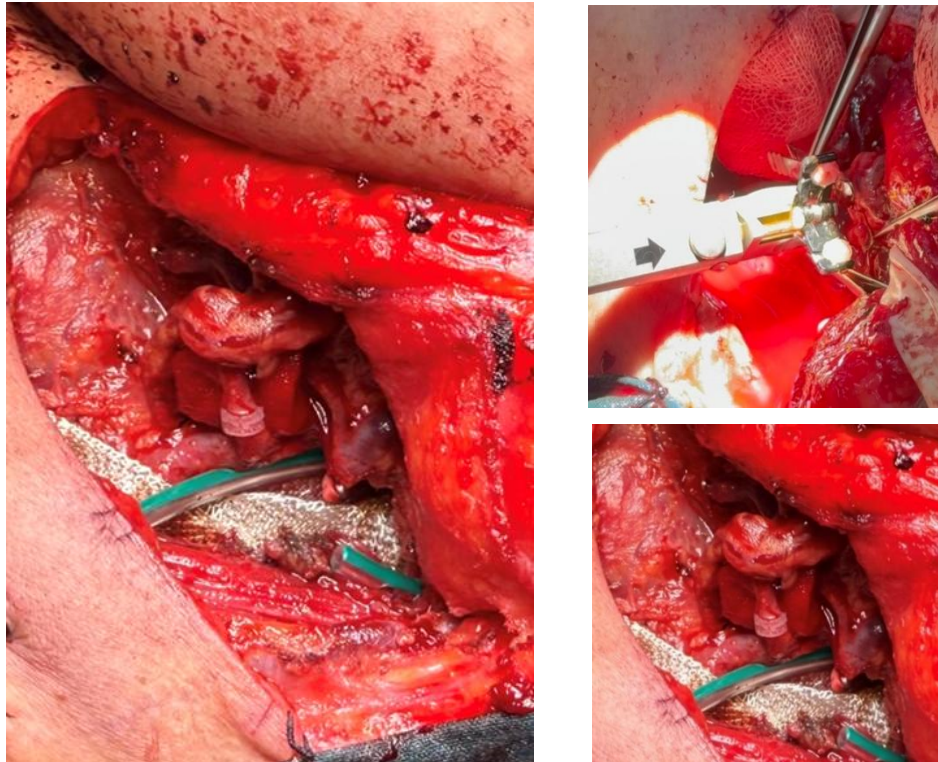


Figure 2 Intraoperative view of the left neck showing the anastomotic coupler device joining the flap vein to the facial vein, immediately after completion.

The coupler was applied according to the device's standard technique². The diameters of the facial vein and cephalic vein were measured using the vessel sizer provided with the coupler system. Both vessels measured approximately 3 mm in diameter; therefore, a 3-mm coupler was selected. Each vessel end was then passed through its corresponding ring and everted so that the intimal surface fully covered the interlocking pins, with care taken to avoid trapping the adventitia between the pins. Care was taken to avoid trapping adventitia between the pins, which would prevent complete wall apposition. The two rings were then approximated with the applicator until an audible click confirmed engagement. The anastomosis was inspected once more to confirm that no vessel wall had slipped off the pins and that the pedicle was not twisted, before releasing the clamps and visually confirming patency. The entire process took under 10 minutes per anastomosis, compared with the 30-60 minutes typically required for hand-sewn technique.

Table 1 Summarizes the key clinical data for this patient.

Sex/Age	Female, 60 years
Comorbidities	Type 2 diabetes mellitus, hypertension, dyslipidemia no family history of malignancy, no prior surgery
Presenting complaint	Left lateral tongue ulcer for approximately 2 months prior to presentation, non-bleeding, oral intake preserved
Physical examination	3x3 cm ulcerative mass of the left lateral tongue, extending to the midline and floor of mouth
Incisional biopsy	Spindle cell neoplasm, highly suspicious for spindle cell squamous cell carcinoma
CT scan oral cavity	Left lateral tongue mass invading the left hyoglossus muscle and left lateral tongue base, 3.8x1.4x2.5 cm, with enlarged left level I-II nodes measuring 0.9-1.0 cm
Surgery	Left hemiglossectomy with left modified neck dissection (level I-V) with reconstruction with a radial forearm free flap (RFFF) with STSG
Vascular anastomosis	One venous anastomoses: facial vein- cephalic vein via anastomotic coupler device; Arterial anastomosis: facial artery - radial artery via hand-sewn microsuture
Final pathology	Squamous cell carcinoma, poorly differentiated, non-keratinizing; tumor size 3.1x1.5 cm; depth of invasion 1.5 cm; lymphovascular invasion (LVI) not identified; perineural invasion (PNI) present; free resection margins
Lymph nodes	Level IA: no metastasis (0/3); Level IB: metastasis in 3/6 nodes, largest deposit 1 cm, extranodal extension present; Level II-V: metastasis in 8/16 nodes, largest deposit 1.2 cm, extranodal extension present; overall 11/25 nodes positive with extracapsular extension (ECE)
Pathologic staging	pT3N3bM0, Stage IVB

Table 1 summarizes the key clinical data for this patient. (cont.)

Adjuvant treatment	Referred for postoperative concurrent chemoradiotherapy in view of extranodal extension
Post concurrent chemoradiotherapy (CCRT)	Post CCRT, the patient tolerated treatment well. The flap remained well-healed with no abnormal granulation tissue at the anterior floor of mouth; the neck wound had healed well
follow-up at 6 months	Flap fully viable with an excellent outcome; no coupler-related complications or venous congestion/thrombosis throughout follow-up

Final histopathology confirmed squamous cell carcinoma, poorly differentiated, non-keratinizing, measuring 3.1x1.5 cm with a depth of invasion of 1.5 cm. Lymphovascular invasion was not identified, but perineural invasion was present; resection margins were free of tumor. Neck dissection specimens showed metastasis in 11 of 25 lymph nodes overall, with extranodal extension (ENE) present at level IB and level II-V. The disease was staged as pT3N3bM0, Stage IVB, and the patient was referred for postoperative concurrent chemoradiotherapy in view of the extranodal extension.

Postoperative flap monitoring relied primarily on clinical assessment: color, skin temperature, tissue turgor, capillary refill time, and a pinprick test at the flap tip to assess the character of the bleeding. A well-perfused flap bleeds bright red blood that wells up within a few seconds of the prick; venous congestion produces dark blood that flows briskly and in excess; and arterial insufficiency typically yields little or no bleeding, or a markedly delayed response. Shen and colleagues, in a systematic review, concluded that these clinical methods remain the mainstay of monitoring at most centers worldwide, even as implantable Doppler probes and near-infrared spectroscopy have become more widely available as adjuncts⁵. This patient was assessed clinically every 4-6 hours for the first 72 postoperative hours, with the interval lengthened progressively thereafter; at no point during the critical period was there an indication for return to the operating room for re-exploration.

On postoperative day 7, intraoral examination showed a viable flap, pink in color and well apposed to the surrounding tissue, with no evidence of venous congestion or ischemia, as shown in Figure 3.



Figure 3 Intraoral endoscopic view on postoperative day 7 showing a viable radial forearm free flap with good pink color and no venous congestion or ischemia.

On postoperative day 14, follow-up examination again showed a well-viable flap, fully apposed to the surrounding tissue margin, with no complications, as shown in Figure 4.



Figure 4 Intraoral view on postoperative day 14 showing a fully viable radial forearm free flap, well apposed to the surrounding tissue margin.

At one month postoperatively, follow-up examination showed a persistently viable flap with stable shape and color, fully apposed to the surrounding tissue margin, with no complications, as shown in Figure 5.



Figure 5 Intraoral view at one month postoperatively showing a fully viable radial forearm free flap, well apposed to the surrounding tissue margin.

Postoperatively, the patient recovered well and commenced concurrent chemoradiotherapy (CCRT) within 4 weeks of surgery. The flap remained fully viable throughout the postoperative and adjuvant treatment periods, with satisfactory healing of both the flap and neck wound. No abnormal granulation tissue was observed at the anterior floor of the mouth. There was no clinical evidence of vascular compromise or other flap-related complications during follow-up.

The patient completed CCRT without significant complications. At 3 months following completion of radiotherapy, the flap remained viable with excellent healing, and there was no clinical evidence of tumor recurrence. No coupler-related complications, including venous thrombosis, hematoma, or coupler exposure, were observed throughout the follow-up period.

Discussion

The outcome in this patient is consistent with a now substantial body of international literature. Frederick and colleagues followed 261 coupled anastomoses in 234 patients and found that the device shortened operative time and reduced vascular complications⁶. Zhang and colleagues reported flap survival rates as high as 94.9-95.4% with the coupler across 173 flaps², and Farsi and colleagues obtained a comparable figure of 97.7% in 204 patients³. This patient received a single venous anastomosis; however, Zhang et al. reported a higher thrombosis rate in flaps with a single venous anastomosis (8.6%) compared with those with two venous anastomoses (1.7%)². Nonetheless, this patient achieved a favorable outcome without complications.

Some coupler models incorporate a micro-Doppler probe into the device itself (the flow coupler), enabling continuous postoperative monitoring of flap perfusion without relying on clinical observation alone⁴. Bowe and colleagues found that this approach significantly increased flap salvage rates compared with clinical monitoring alone⁷. This patient's coupler did not include a Doppler probe, and monitoring remained primarily clinical; the outcome was nonetheless favorable. It is worth noting, however, that incorporating flow monitoring in future cases would likely add a further margin of confidence to postoperative surveillance.

A dimension that is often overlooked when considering adoption of the coupler is cost. Head and McKay, using activity-based costing, compared the coupler with hand-sewn technique and found that although the device itself costs more per unit than suture, the time saved in the operating room made the coupler faster to break even and, overall, less expensive⁸. More directly relevant to the Thai context is the study by Arora and colleagues from India, who analyzed 1,694 venous anastomoses performed in a public hospital setting: the coupler group had a thrombosis rate of only 0.97% versus 6.4% for hand-sewn anastomoses, a mean anastomosis time of 5 ± 2 minutes versus 17 ± 4 minutes, and a flap loss rate that fell from 2.56% to 0.55%⁹. This finding speaks directly to a question institutions in Thailand often raise, namely whether the technology is genuinely usable in a resource-constrained system, and the Indian experience suggests that it is, and is not confined to high-income referral centers.

The coupler is also beginning to be applied to arterial anastomosis, though this remains far less widespread than its venous application. A recent systematic review reported arterial coupling success rates at a level that appears clinically usable¹⁰. This patient's arterial anastomosis was still hand-sewn according to conventional practice, but with adequate equipment and operator experience, extending coupler use to the artery in future cases appears feasible as well.

A genuine concern is the device's own long-term complications, particularly exposure or extrusion of the coupler through the overlying skin or mucosa. Kubo and colleagues reported a case of coupler exposure at seven months postoperatively in a patient who, like this one, had received postoperative radiotherapy¹¹. This patient therefore still requires continued long-term follow-up, since irradiated tissue tends to thin and become more fragile, increasing the likelihood of coupler exposure even after the flap appears well settled.

Several institutions in Thailand have accumulated experience and published outcomes of head and neck free flap reconstruction, yet reports specifically addressing the coupler

remain scarce; our search during the preparation of this report found essentially no published data on the topic. Taken together with the economic evidence above^{8,9}, we believe this initial experience may serve as a useful reference for other institutions considering adoption of the device and as a potential foundation for future implantable flap-monitoring systems. This report has clear limitations: it describes a single patient, follow-up remains short, and there is no comparison group treated with hand-sewn technique at the same institution, so no policy-level recommendation can be drawn. A more definitive answer would require prospective case series across multiple institutions, evaluating both cost-effectiveness and appropriateness before wider adoption within the Thai public health system.

Conclusion

This case demonstrates that an anastomotic coupler can be used successfully for venous anastomosis in RFFF reconstruction following tongue cancer resection in Thai clinical practice, with complete flap survival and no vascular complications throughout follow-up, even through postoperative concurrent chemoradiotherapy. This outcome is consistent with the safety data reported internationally and may serve as a starting point encouraging other institutions in Thailand to consider adopting this technology.

Consent Statement

Ethics approval and consent to participate: This case report was approved by the Human Research Ethics Committee of the National Cancer Institute (Approval No. 055/2569). Written informed consent was obtained from the patient.

Consent for publication: Written informed consent for publication of this case report and accompanying clinical images was obtained from the patient.

Conflict of interest: The authors declare no conflict of interest.

Funding: None declared.

Acknowledgments

We acknowledge Dr. Narin Ratanaprasert, Dr. Panutas Piyananthasomdee, Dr. Rojana Yansomboon, and Dr. Supakarn Jeanbunjongkij for their kind technical support.

References

1. Tangjaturonrasme N, Vatanasapt P, Bychkov A. Epidemiology of head and neck cancer in Thailand. *Asia Pac J Clin Oncol*. 2018;14(1):16-22.

2. Zhang T, Lubek J, Salama A, Caccamese J, Coletti D, Dyalram D, Ord R. Venous anastomoses using microvascular coupler in free flap head and neck reconstruction. *J Oral Maxillofac Surg.* 2012;70(4):992-6.
3. Farsi S, Held M, Brannon M, Eckard P, King D, Vural E, Sunde J, Moreno M. The microvascular anastomotic coupler for venous anastomosis in head and neck reconstruction: an institutional experience. *Cureus.* 2024;16(7):e64467.
4. Zhang T, Dyalram-Silverberg D, Bui T, Caccamese JF Jr, Lubek JE. Analysis of an implantable venous anastomotic flow coupler: experience in head and neck free flap reconstruction. *Int J Oral Maxillofac Surg.* 2012;41(6):751-5.
5. Shen AY, Lonie S, Lim K, Farthing H, Hunter-Smith DJ, Rozen WM. Free flap monitoring, salvage, and failure timing: a systematic review. *J Reconstr Microsurg.* 2021;37(3):300-8.
6. Frederick JW, Sweeny L, Carroll WR, Rosenthal EL. Microvascular anastomotic coupler assessment in head and neck reconstruction. *Otolaryngol Head Neck Surg.* 2013;149(1):67-70.
7. Bowe CM, Twigg J, Salker AM, Doumas S, Ho MW. Outcomes of anastomotic venous flow couplers in head and neck free flap reconstruction - five-year experience in a single centre. *Br J Oral Maxillofac Surg.* 2022;60(6):847-51.
8. Head LK, McKay DR. Economic comparison of hand-sutured and coupler-assisted microvascular anastomoses. *J Reconstr Microsurg.* 2018;34(1):71-6.
9. Arora R, Mishra KS, Bhoje HT, Dewan AK, Singh RK, Naalla R. Mechanical anastomotic coupling device versus hand-sewn venous anastomosis in head and neck reconstruction: an analysis of 1694 venous anastomoses. *Indian J Plast Surg.* 2021;54(2):118-23.
10. Pafitanis G, Nicolaides M, O'Connor EF, Raveendran M, Ermogenous P, Psaras G, Rose V, Myers S. Microvascular anastomotic arterial coupling: a systematic review. *J Plast Reconstr Aesthet Surg.* 2021;74(6):1286-1302.
11. Kubo T, Kitamura N, Onoda M, Maeda D, Matsuda K, Hosokawa K. Exposure of a microvascular anastomotic coupler in head and neck reconstruction: a case report. *Eplasty.* 2014;14:e18.