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Clinical Profile and Outcomes of Transarterial Chemoembolization (TACE) as Neoadjuvant Therapy in Locally Advanced Tongue Cancer at Dr. Hasan Sadikin General Hospital

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ABSTRACT

Background: Advanced or inoperable tongue cancer presents a significant therapeutic challenge. Transarterial chemoembolization (TACE) has emerged as a potential modality for locoregional control by delivering targeted chemotherapy directly to the tumour. Compared to systemic chemotherapy, TACE achieves higher intratumoural drug concentrations while minimizing systemic toxicity, thus helping preserve patients' quality of life.
Objective: To describe the clinical characteristics and outcomes of patients with inoperable tongue cancer who underwent TACE at Dr. Hasan Sadikin General Hospital between 2024 and 2025.
Methods: This descriptive observational study included 12 patients diagnosed with inoperable tongue cancer treated with TACE. Data on demographics, tumour location, histopathology, number of sessions, and treatment response were analyzed.
Results: Among 12 patients, 7 (58%) were male and 5 (42%) female, aged 24–73 years (mean 48.4). Squamous cell carcinoma (SCC) was the predominant histopathology (91.7%), mostly affecting the left tongue (75%). The majority (58%) underwent two or more TACE sessions. Post-treatment evaluation showed partial response in 7 patients (58%), stable disease in 4 (33%), and progressive disease in 1 (8%). Four patients (33%) initially considered inoperable achieved sufficient tumour regression for definitive surgery. Histopathology of resected specimens confirmed well-differentiated SCC with clear margins in all surgical cases.
Conclusion: TACE demonstrates encouraging outcomes in managing inoperable tongue cancer, providing effective tumour control with fewer systemic side effects than conventional chemotherapy. It may also serve as a neoadjuvant bridge to surgery in selected cases.

Keywords: Tongue cancer; Transarterial chemoembolization (TACE); Neoadjuvant therapy.

INTRODUCTION

Tongue cancer, a subtype of oral cavity squamous cell carcinoma (SCC), is a significant public health concern due to its aggressive nature and high propensity for local invasion and lymphatic spread. Oral cavity cancers account for about 2%–4% of all malignancies worldwide, with the tongue being the most commonly affected site, particularly the lateral border and ventral

surface. Its rising incidence in both developed and developing countries is largely attributed to tobacco, alcohol, betel quid use, and human papillomavirus (HPV) infection (1–3). Despite advances in surgery, radiotherapy, and systemic chemotherapy, the management of locally advanced tongue cancer remains challenging. Many patients present with stage III–IV disease, where surgery is often unfeasible or associated with major functional morbidity (4,5). Achieving locoregional control while maintaining quality of life thus requires a multimodal approach. However, systemic chemotherapy provides limited intratumoral drug delivery and is often hindered by toxicities that impair performance status and delay definitive treatment (6,7).

Neoadjuvant chemotherapy has been widely explored to downstage locally advanced or initially unresectable head and neck cancers, facilitating surgical resection and improving survival outcomes. Agents such as cisplatin, 5-fluorouracil, and docetaxel demonstrate cytoreductive efficacy but are often limited by systemic toxicities such as myelosuppression, nephrotoxicity, and mucositis (8–10). These limitations have driven interest in regional drug delivery methods that maximize local cytotoxicity while minimizing systemic exposure.

Transarterial chemoembolization (TACE), initially developed for hepatocellular carcinoma, has been adapted for various solid tumours, including head and neck cancers (11–13). By selectively catheterizing the tumour-feeding artery to deliver chemotherapeutic agents with embolic materials, TACE combines direct cytotoxicity and ischemic necrosis. This achieves high intratumoral drug concentrations and prolonged contact time while limiting systemic spread, improving local control and potentially enabling surgical conversion in previously inoperable cases (14–16).

Recent reports have shown encouraging outcomes for TACE in non-hepatic malignancies, including head and neck cancers, particularly in patients with recurrent or unresectable disease (17–19). These studies suggest improvements in locoregional control, reduction in tumour volume, and symptomatic relief with minimal systemic toxicity. Nonetheless, evidence specific to tongue cancer remains limited, as most available data are derived from small case series or pilot studies. Furthermore, the absence of standardized protocols for agent selection, embolic materials, and treatment intervals highlights the need for institutional experience to better define patient selection and optimize therapeutic outcomes (20–22).

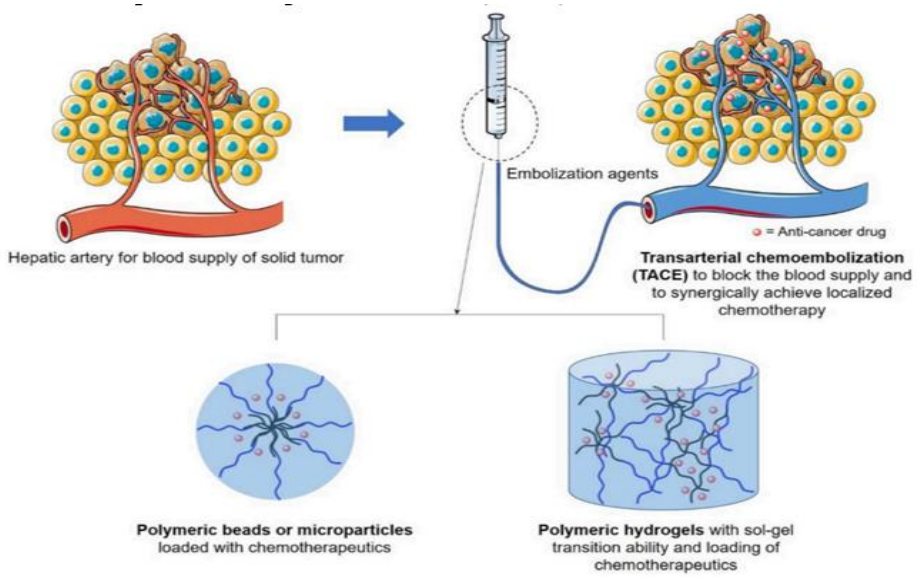

Figure 1. Schematic illustration of TACE agents (23)

Given the increasing incidence of advanced-stage tongue cancer and the limitations of current treatment modalities, evaluating TACE as a neoadjuvant approach holds important clinical relevance. As a tertiary oncology referral center in West Java, Indonesia, Dr. Hasan Sadikin General Hospital manages numerous patients with advanced head and neck malignancies, many presenting with inoperable disease. Implementing TACE in this population offers an opportunity to assess its role in achieving locoregional control and facilitating surgical resection in selected cases. Therefore, this study aims to describe the demographic, clinical, and treatment response profiles of patients with inoperable tongue cancer who underwent TACE as neoadjuvant therapy, providing insights that may strengthen the evidence for interventional oncology in head and neck cancers and guide future prospective research.

MATERIALS & METHODS

This descriptive observational study was conducted at the Division of Head and Neck Oncology, Department of General Surgery, Dr. Hasan Sadikin General Hospital, Bandung, Indonesia, between January 2024 and June 2025. The hospital is a tertiary referral center managing complex oncology cases from West Java and neighboring provinces. Inclusion criteria comprised absence of distant metastasis on imaging, Eastern Cooperative Oncology Group (ECOG) performance status 0–2, and adequate hematologic, hepatic, and renal function. Patients who had received systemic chemotherapy within six months, had coagulopathy, or contraindications to angiography were excluded. Baseline assessment included detailed clinical evaluation, imaging with contrast-enhanced CT or MRI, and laboratory tests. Staging followed the American Joint Committee on Cancer (AJCC) 8th Edition system.

All transarterial chemoembolization (TACE) procedures were performed under local anesthesia and conscious sedation by an interventional radiologist using the Seldinger technique for femoral artery access. A 5-French catheter was advanced into the external carotid artery for selective angiography to identify the tumor-feeding vessel—most commonly the lingual artery. A chemotherapeutic emulsion containing cisplatin (50–75 mg/m²) and doxorubicin (30–40 mg/m²) mixed with lipiodol was infused, followed by embolization with gelatin sponge particles (Gelfoam) until near-stasis of flow was achieved. Post-procedure, patients were monitored for 24–48 hours with supportive therapy and repeat laboratory tests. Follow-up evaluations were conducted every 3–4 weeks, assessing treatment response using RECIST 1.1 criteria through clinical and radiologic findings: complete response (CR), partial response (PR), stable disease (SD), or progressive disease (PD). Toxicities were graded according to CTCAE version 5.0. Patients showing tumor regression or downstaging were reassessed by the tumor board for surgical eligibility, with conversion considered when negative margins could be achieved. Those unsuitable for surgery continued radiotherapy or palliative care as indicated.

Data on demographics, tumor characteristics, treatment parameters, and outcomes were retrieved from medical records and analyzed using SPSS version 26.0. Continuous variables were expressed as mean ± standard deviation, and categorical data as frequencies and percentages. The data were presented in tabular and graphical form to illustrate treatment response patterns and patient distribution across clinical parameters.

RESULT

During the study period from January 2024 to June 2025, 12 patients with inoperable tongue cancer underwent transarterial chemoembolization (TACE) as neoadjuvant therapy. The mean age was 48.4 years (range 24–73 years), with seven men (58%) and five women (42%), giving a male-to-female ratio of 1.4:1. Most patients had tumors on the left side of the tongue (75%), and nearly all were diagnosed with squamous cell carcinoma

(SCC), except for one patient with adenoid cystic carcinoma. The majority of cases were classified as stage IVA (T4aN1–2M0) according to the AJCC 8th Edition, showing deep muscle invasion or extension to adjacent structures, without evidence of distant metastasis.

All patients successfully completed at least one TACE session, and no procedural mortality occurred. The mean number of sessions was two (range 1–3). In ten patients, the lingual artery was identified as the main feeding vessel, while the facial artery was accessed in two cases because of anatomical variation. Cisplatin (65 mg/m²) and doxorubicin (35 mg/m²) were used in all patients, mixed with lipiodol and followed by embolization using gelatin sponge particles (Gelfoam) until near stasis was achieved. No dose reductions were required. The average procedure time was 70 minutes (range 55–90 minutes).

Tumor response was assessed 6–8 weeks after the final TACE session using RECIST version 1.1 criteria. Partial response (PR) was achieved in seven patients (58%), stable disease (SD) in four (33%), and progressive disease (PD) in one (8%). None achieved a complete response. The average reduction in tumor diameter among patients with PR was 35% (range 30–45%). Clinically, most patients reported reduced local pain, improved swallowing, and visible reduction of tumor mass. Four patients (33%) who initially presented with inoperable disease showed sufficient regression to proceed with curative surgery following multidisciplinary reassessment.

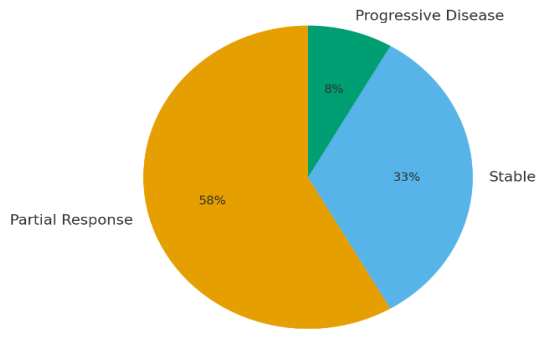

Figure 2. Patient's treatment response distribution

The procedure was generally well tolerated. The most frequent side effects were transient fever (41%), mild to moderate oropharyngeal pain (58%), and localized tongue swelling (50%), all resolving within 72 hours with supportive care. Two patients (16%) experienced mild mucositis that was managed conservatively. There were no cases of significant hepatic dysfunction, hematologic toxicity, or vascular injury. No patient required readmission, and no treatment-related deaths occurred.

Four patients who achieved partial response later underwent definitive surgery within 3–6 weeks after their last TACE. Histopathological analysis of resected specimens showed extensive tumor necrosis and a marked reduction in viable tumor cells, indicating effective locoregional cytotoxicity. At a median follow-up of six months (range 3–10 months), all four surgically treated patients remained disease-free. The remaining eight patients continued with palliative management or radiotherapy as indicated. One patient with progressive disease experienced worsening symptoms and was transitioned to best supportive care.

DISCUSSION

This study evaluated the clinical characteristics and treatment outcomes of patients with inoperable tongue cancer who underwent transarterial chemoembolization (TACE) as neoadjuvant therapy at Dr. Hasan Sadikin General Hospital. The findings show that TACE achieved meaningful locoregional tumor control in most patients, with partial response in 58% and stable disease in 33%. Furthermore, one-third of patients initially deemed inoperable became eligible for curative surgery following treatment. The procedure was safe and well tolerated, with no treatment-related mortality or severe systemic toxicity. These results support the potential of TACE as a locoregional bridge in the multidisciplinary management of advanced tongue cancer, particularly in resource-limited settings where access to complex surgery or systemic chemotherapy is restricted.

TACE has long been established as an effective palliative and neoadjuvant modality in hepatocellular carcinoma, significantly improving survival and tumor control compared with best supportive care (1,2). Its adaptation to head and neck oncology is relatively recent but increasingly supported by clinical evidence. Gupta et al. and Zhao et al. reported encouraging outcomes using intra-arterial cisplatin-based chemoembolization in advanced or recurrent oral cavity cancers, achieving partial response rates of 40–60% with manageable toxicity (3,4). Yamamoto et al. similarly observed tumor shrinkage in 52% of patients with oral SCC treated with superselective intra-arterial chemotherapy, enabling surgical resection in selected cases (5). The results of the present study align closely with these findings, suggesting that arterial-targeted chemotherapy can achieve substantial cytoreduction and tumor downstaging. The surgical conversion rate of 33% in our cohort compares favorably with the 20–35% conversion rates reported in other studies involving unresectable head and neck SCC (6–8).

The therapeutic effect of TACE derives from its dual mechanism—direct cytotoxic chemotherapy and ischemic tumor necrosis. The selective infusion of chemotherapeutic agents such as cisplatin and doxorubicin into the tumor-feeding artery achieves intratumoral drug concentrations up to 10–20 times higher than systemic administration (9). Subsequent embolization with materials like Gelfoam induces vascular stasis, prolonging local drug retention and promoting hypoxic necrosis (10,11). This combined effect enhances locoregional cytotoxicity while limiting systemic exposure. In tongue cancer, where vascularization is predominantly supplied by the lingual and facial arteries, superselective catheterization allows precise drug delivery to the tumor microenvironment. This targeted approach minimizes systemic toxicity—such as myelosuppression and nephrotoxicity—commonly associated with systemic chemotherapy, while aligning with modern principles of organ-preserving oncologic therapy (8,12,13).

The feasibility and tolerability of TACE observed in this series support its role as an effective neoadjuvant or bridging therapy for locally advanced, inoperable tongue cancer. Several practical advantages can be emphasized. First, TACE enhances local control by delivering high-dose chemotherapy directly to the tumor bed, thereby reducing tumor volume prior to definitive therapy. Second, this cytoreduction can facilitate surgical conversion, offering curative opportunities for patients who would otherwise remain unresectable. Third, by minimizing systemic toxicity, TACE preserves patient performance status and nutritional capacity—key determinants for successful subsequent treatment. Finally, because TACE can be performed in centers equipped with interventional radiology facilities, it represents a viable and cost-effective treatment option in low- to middle-income settings. These findings are consistent with prior studies emphasizing the expanding role of intra-arterial therapies in non-hepatic malignancies (4,19–22).

The present study's safety profile mirrors findings from prior literature, where post-embolization syndrome—characterized by transient fever, pain, and localized swelling—was the most common but self-limiting adverse event (12,13). No major hepatic or hematologic complications occurred, confirming the pharmacologic advantage of locoregional drug delivery over systemic exposure. Nonetheless, accurate angiographic mapping and awareness of vascular variations in the external carotid artery are essential to prevent non-target embolization and soft-tissue necrosis (14,15). In this cohort, mild mucositis and localized edema were observed but resolved with conservative treatment, underscoring that TACE is safe when performed by experienced operators under multidisciplinary supervision.

Surgical conversion following neoadjuvant therapy is a key measure of clinical benefit in

advanced cancers. In the present study, 33% of patients achieved operability after TACE, with histopathology demonstrating extensive tumor necrosis and reduced viable tumor cell density, indicating genuine cytoreduction rather than imaging artifact. Kim et al. reported similar outcomes, achieving a 28% conversion rate in advanced oral SCC following superselective intra-arterial chemotherapy (16). Restoration of resectability is clinically meaningful, as surgical intervention remains the primary determinant of long-term survival in head and neck SCC (17,18). These results strengthen the rationale for integrating TACE into preoperative treatment algorithms for selected patients with advanced tongue cancer.

The main limitations of this study include its small sample size, single-center design, and lack of a control group receiving standard systemic or neoadjuvant chemotherapy. These factors limit generalizability and statistical inference regarding survival outcomes. Furthermore, variations in vascular anatomy and treatment parameters, such as drug dosage or embolic endpoint, may have influenced individual responses. The short median follow-up of six months also precludes definitive conclusions about long-term disease control or recurrence. Future research involving larger multicenter cohorts, standardized protocols, and longer follow-up is warranted to validate these findings and optimize TACE protocols in head and neck oncology (20,21).

Future studies should investigate the integration of TACE with systemic chemotherapy, radiotherapy, or immunotherapy to explore potential synergistic effects. Incorporating advanced imaging modalities such as dynamic contrast-enhanced MRI or PET-CT could improve evaluation of perfusion changes and treatment response. In parallel, translational research examining molecular and microenvironmental alterations following TACE may clarify mechanisms of sensitivity or resistance in oral SCC (22,23). Establishing standardized patient selection criteria and procedural guidelines will be essential to ensure reproducibility, enhance safety, and define TACE's optimal role across diverse healthcare systems.

In summary, TACE represents a promising, minimally invasive locoregional treatment for patients with locally advanced, inoperable tongue cancer. It achieved significant tumor regression, enabled surgical conversion in one-third of patients, and showed an acceptable safety profile. These results align with growing evidence supporting the use of intra-arterial therapies in head and neck cancers and highlight the potential for TACE to serve as an effective bridge to curative treatment in well-selected cases.

CONCLUSION

This study demonstrates that Transarterial Chemoembolization (TACE) when used as a neoadjuvant modality, can offer meaningful locoregional control and open a potential pathway toward surgical resection in patients with previously inoperable tongue cancer. However, larger prospective trials with standardized protocols and longer follow-up are warranted to confirm these results, evaluate survival benefits, and establish the role of TACE within contemporary head and neck cancer management algorithms.

Declaration by Authors

Ethical Approval: Approved

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Conflict of Interest: The authors declare no conflicts of interest relevant to this research.

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