

Salvage Neck Dissection in Head and Neck Squamous Cell Carcinoma: Balancing Necessity and Quality of Life

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Introduction and Context

Salvage neck dissection (ND) plays an important role in the treatment of recurrent or persistent head and neck squamous cell carcinoma (HNSCC), specifically addressing mucosal primaries of the upper aerodigestive tract. The ideal timing and technique for salvage ND depends on two unique clinical scenarios. First, surgery after chemoradiotherapy (CRT) can be considered either as the scheduled procedure or if there is residual disease. Historically, routine planned ND for N2–N3 disease has shifted towards a selective approach depending on post-treatment imaging response, usually performed at 10–12 weeks following completion of chemoradiotherapy. Secondly, ND for salvage in recurrence after a disease-free interval is a distinct entity. For solitary neck recurrence, salvage ND represents the main therapeutic strategy with 5-year survival ranging between 20–60%, more favourable when a longer interval from the time of disease-free survival was reached (>12–24 months). In recurrent primary with clinically N0 neck, there is risk stratification to decide whether or not an elective ND should be performed—occult nodal disease presents only in 6% of early glottic recurrences but in 31% of advanced non-laryngeal recurrences [1]. These two scenarios would require different patient selection and surgical planning.

Evidence Supporting Salvage Neck Dissection

In support of salvage ND, several studies have demonstrated that timely surgical intervention can provide mean-

ingful survival benefit and durable disease control in appropriately selected patients. In this vein, the historical approach to N2–N3 patients who underwent planned neck dissection post-completion of CRT regardless of imaging has now evolved to be more selective, based on post-treatment imaging. A landmark randomized trial published by Mehanna *et al.* [2] showed that Positron Emission Tomography (PET)-Computed Tomography (CT)-guided surveillance at 12 weeks after CRT, with neck dissection only for incomplete responses on PET, produced similar survival to planned ND and avoided unnecessary surgery in many cases. While clinical trials are exploring personalized approaches based on factors like Human Papillomavirus (HPV) status and tumour characteristics, current standard practice still largely treats recurrent head and neck cancers with similar protocols regardless of these factors. Despite emerging evidence suggesting potential for de-escalation in certain populations (particularly HPV-positive patients), this approach remains investigational and has not yet been widely implemented in routine clinical care. In current practice, decisions regarding surgical salvage versus re-irradiation are primarily guided by more established factors: the technical resectability of the recurrence, the interval since previous radiation, the cumulative radiation dose to critical structures, and the patient's performance status. Recurrent disease, limited to a single nodal site in the neck, is more likely to be salvageable with an ND than if there are extensive former disease sites, as a loco-regional relapse. Patients with HPV-positive oropharyngeal carcinoma generally have better outcomes, and if they develop a recurrence, they are more likely to be salvaged with aggressive therapy, whereas HPV-negative tumours more commonly indicate a negative biology. The time to recurrence from initial therapy is also a crucial factor; a long disease-free interval greater than 12–24 months may point to a new opportunity for cure; in contrast, very early recurrences or progression during the non-surgical treatments imply resistant disease. New prognostic models are being generated to

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aid in the decision about who is likely to benefit from salvage surgery, including the initial tumour stage, site of recurrence, and time to recurrence, as a recent pre-operative scoring system designed to stratify patients likely to benefit [3].

Special Clinical Scenarios

A controversial situation is that of the clinically N0 neck at salvage for a head and neck recurrent tumour. Is the elective neck dissection necessary in the presence of a negative (no nodal disease) imaging? Evidence is mixed. A large retrospective study has reported occult metastatic nodes (OMN) in the range of almost 16% in Italy in patients who were cN0 at salvage surgery [1]. The probability of OMN was especially low in small recurrent laryngeal (glottic) tumours (6% for T1–T2 recurrences), but higher (31%) in advanced recurrent tumours outside the larynx. These survival results are consistent with this trend: patients with OMN had far worse 5-year survival (38%) compared to those with negative nodes (71%). According to such data, one might avoid performing elective ND in the very low-risk situation, as in the case of a small recurrent glottic cancer with no evidence of neck disease, but recommend neck dissection in most other salvage treatments, since otherwise where the risk of OMN is considerable.

A study compared indicated salvage ND with refusal to undergo surgery. Among HNSCC patients, the median survival was 22 and 9.7 months, respectively, for those who were able to undergo and willing to undergo salvage surgery compared with those who declined surgery [4]. Indeed, the risk of death was significantly greater in the non-surgery group, and the authors suggest that salvage surgery is greatly beneficial for this patient population and should be considered the main standard of care. From the same institution, a 5-year disease-specific survival (DSS) of ~55% was reported [5], meaning that just over half the patients would experience long-term cancer control. Crucially, that survival advantage held regardless of whether complications occurred, or whatever the first therapy was, indicating that, on balance, it helps to surgically eliminate left-behind cancer when at all possible. These data emphasize that salvage neck dissection, despite its challenges, represents the primary curative option for isolated nodal recurrence. With that said, salvage ND is hardly a certain cure. A significant number of patients will nonetheless recur or develop metastasis following technically successful ND. In a recent study of patients undergoing “salvage ND” after CRT for different Head & Neck cancer primaries, resulted in >40% of patients were found to have proven residual cancer in the resected nodes, with many subsequently suffering new relapse despite the surgery [5]. Patients with residual tumour in dissected specimens fared worse than those with a pathologically clear neck, suggesting that residual cancer is associated with biologically aggressive disease [6].

Functional and Quality of Life Outcomes

Beyond oncologic results, functional outcomes and quality of life considerations play a central role in determining the appropriateness of salvage ND.

Operating in a previously irradiated, scarred neck is inherently challenging. The fibrosis, distorted anatomy, and friable tissue make salvage ND frequently a more challenging procedure. A recent study from a Japanese centre of patients that had targeted salvage ND following definitive CRT in 28 patients: nearly two-thirds were alive at 3 years, and most had neck control, despite leaving non-tumour bearing neck levels alone [7]. Importantly, the rate of neck recurrence in their series was low and did not result in cancer-related death in most patients. They concluded that it was useful as a therapeutic manoeuvre for neck recurrence and could limit unnecessary tissue sacrifice. The appropriate scope of neck dissection in the salvage setting, however, is controversial [8].

Alternative or Adjunctive Approaches

Although re-irradiation alone could be another salvage option for technically unresectable or surgically unfit cases, adjuvant re-irradiation after salvage neck dissection, discussed here, is clearly connected to the optimization of surgical results [9].

Combined modality adjuvant re-irradiation after salvage neck dissection might be considered for patients with high-risk pathologic features (positive margins, extranodal extension, and multiple positive nodes). Salvage surgery followed by adjuvant re-irradiation yields better local-regional control and OS compared to surgery alone, in a selected population. For adjuvant reirradiation, factors such as interval from previous radiation (preferably >2 years), cumulative dose to normal tissues, and patient performance status need to be carefully evaluated [10].

The complication rate after salvage ND is much higher than that after primary surgery; 50% of patients developed grade 2 or higher complications, while 16% of patients suffered from major (grade 3) complications [11]. These comprise wound infections, dehiscence, fistulas to the pharyngocutaneous, and, more rarely, carotid blowout. Residual nodes >3 cm, disease that is HPV negative, and requirement for radical neck dissection are high-risk features for severe complications. Adjuvant re-irradiation was done, and selection of patients is important since the addition of adjuvant re-irradiation can cause wound complications and late healing.

Shoulder morbidity due to accessory nerve loss is still frequently encountered. Nerve function may have already been compromised by post-radiation fibrosis, and the nerve may need to be sacrificed if involved with the tumour. Such clinical factors will need to be taken into account when considering undertaking a salvage neck dissection with or without adjuvant treatment.

Conclusions and Future Perspectives

Overall, the decision to perform salvage ND requires a careful balance between oncologic necessity and functional preservation, best achieved within a multidisciplinary framework. Here, the surgeon is not just a technician, but a counselor, guiding the patient in weighing the chance of cure against potential functional loss. A few will, when fully informed, prefer palliation to mutilating salvage surgery, and this autonomy needs to be recognized. But survivors who can tolerate salvage therapy receive substantial survival or may even be cured, as mentioned above. As such, treatment needs to be multidisciplinary, involving discussion between surgeons, oncologists, radiologists and rehabilitation specialists, to provide an optimal treatment plan.

Availability of Data and Materials

Not applicable.

Author Contributions

AM and NF conceived the concept. GF, CCE, JRL, SL and ML outlined the editorial and contributed to the discussion. Supervision: AM, NF. Writing – Original Draft: AM. All authors contributed to the critical revision of the manuscript for important intellectual content. All authors read and approved the final manuscript. All authors have participated sufficiently in the work and agreed to be accountable for all aspects of the work.

Ethics Approval and Consent to Participate

Not applicable.

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Conflict of Interest

Antonino MANIACI is serving as one of the Editorial Board Members of this journal. We declare that Antonino MANIACI had no involvement in the review of this article and has no access to information regarding its review. Other authors declare no conflict of interest.

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