



Original Article

## Postoperative Morbidity and Recurrence After Salvage Radical Neck Dissection Versus Upfront Neck Dissection for Advanced Cervical Nodal Disease: A Single-Centre Comparative Study

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### ABSTRACT

**Background:** Advanced cervical nodal disease in head and neck cancer carries a high risk of locoregional failure. The timing of neck dissection is clinically important, as salvage surgery may be complicated by treatment-related fibrosis and impaired healing.

**Methods:** This comparative study was conducted in the Department of Head and Neck Oncology, State Cancer Institute, Gauhati Medical College, Guwahati, from June 2023 to June 2024. Forty patients with advanced nodal head and neck disease were assessed: 20 underwent salvage radical neck dissection and 20 underwent upfront neck dissection. Healing, dysphagia, surgical-site pain, neck and shoulder stiffness, recurrence, and prognosis were compared between groups.

**Results:** Delayed healing was more frequent after salvage surgery than upfront surgery (80% vs 40%;  $p=0.0339$ ), whereas well-healed wounds were more common in the upfront group (50% vs 15%). Surgical-site pain was reported by 80% of patients undergoing salvage surgery and 25% undergoing upfront surgery ( $p=0.0015$ ). Recurrence occurred in 60% and 20% of the salvage and upfront groups, respectively ( $p=0.0098$ ). A favourable prognosis was documented more often following upfront neck dissection (80% vs 40%;  $p=0.0268$ ). Dysphagia, neck stiffness, and shoulder stiffness were numerically more frequent in the salvage group, but the differences were not statistically significant.

**Conclusion:** In this cohort, upfront neck dissection was associated with better wound healing, less postoperative pain, lower recurrence, and a more favourable prognosis than salvage radical neck dissection. Larger studies with standardised follow-up and adjustment for disease-related factors are needed to confirm these findings.

**Keywords:** Advanced nodal disease; Head and neck cancer; Neck dissection; Salvage surgery; Postoperative outcomes.

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### INTRODUCTION

Head and neck squamous cell carcinoma remains a major oncological challenge in India, where tobacco exposure, areca-nut use, alcohol consumption and, increasingly, human papillomavirus-associated disease contribute to a substantial burden of malignancy<sup>[1]</sup>. Cancers arising from the upper aerodigestive tract commonly spread to cervical lymph nodes, and nodal involvement is among the most important determinants of locoregional control and survival. Bulky nodal disease, multiple involved nodes, extranodal extension and high nodal burden are recognised adverse prognostic features<sup>[2,3]</sup>. Advanced cervical nodal disease, broadly represented by N2 and N3 categories, is therefore associated with increased risks of regional persistence, recurrence and distant metastasis.

Management of the clinically node-positive neck has evolved alongside organ-preservation strategies. Depending on the primary site, tumour extent and nodal characteristics, treatment may include primary surgery followed by adjuvant radiotherapy or chemoradiotherapy, or definitive chemoradiotherapy with surgery reserved for residual or recurrent disease<sup>4,5</sup>. Although non-surgical approaches can preserve anatomy and function in selected patients, residual nodal disease after treatment remains an important clinical concern. Neck dissection may be undertaken upfront as part of the initial treatment plan, as a planned procedure after non-surgical treatment, or as salvage surgery for persistent or recurrent nodal disease.

The timing of surgery is especially relevant in patients with advanced nodal metastases. Upfront neck dissection can remove bulky nodal disease before radiotherapy and avoids operating in a previously irradiated field. It may also improve regional control in selected patients with extensive nodal burden, necrotic nodes or suspected extranodal extension<sup>6,7</sup>. In contrast, salvage neck dissection is often technically more demanding because previous radiation or chemoradiotherapy may produce fibrosis, impaired vascularity, oedema and distorted tissue planes<sup>8</sup>. These changes can compromise wound healing and may increase postoperative pain, infection, fistula formation, dysphagia, shoulder dysfunction and prolonged dependence on feeding or airway support.

The complexity of neck dissection is further heightened by the close relationship of cervical nodal levels to major vessels and nerves, including the carotid system, internal jugular vein and spinal accessory nerve. Thus, the choice of treatment must balance oncological clearance against postoperative morbidity and long-term function. The decision is particularly challenging in patients with persistent or recurrent disease, where previous treatment may limit available surgical and non-surgical options.

Despite advances in imaging, radiotherapy delivery and systemic therapy, the timing and role of neck dissection in advanced nodal disease remain uncertain in several clinical settings. Treatment decisions should be individualised within a multidisciplinary framework, incorporating disease biology, response to initial therapy, surgical feasibility and anticipated morbidity. Comparative data from real-world settings are valuable, especially where treatment pathways and follow-up may differ from those described in high-income centres.

This study compared outcomes after salvage radical neck dissection and upfront neck dissection in patients with advanced nodal head and neck disease, with emphasis on postoperative healing, pain, neck and shoulder stiffness, recurrence and prognosis.

## **MATERIALS AND METHODS**

### **Study Design and Setting**

This single-centre comparative study was conducted in the Department of Head and Neck Oncology, State Cancer Institute, Gauhati Medical College, Guwahati, Assam, India. The study was carried out over a 12-month period, from June 2023 to June 2024. It compared postoperative and clinical outcomes among patients with advanced nodal head and neck disease who underwent either salvage radical neck dissection or upfront neck dissection.

### **Study Population and Sample Size**

The study included 40 patients with advanced cervical nodal disease secondary to head and neck malignancy. Patients were divided into two equal groups according to the surgical treatment received. The salvage group consisted of 20 patients who underwent salvage radical neck dissection, while the upfront group included 20 patients who underwent neck dissection as part of the initial treatment strategy.

### **Eligibility Criteria**

Patients were eligible for inclusion if they had advanced nodal disease associated with oropharyngeal carcinoma, laryngeal carcinoma, or metastatic cervical lymphadenopathy from carcinoma of unknown primary origin. Patients were excluded if they refused consent for participation, were medically unfit to undergo surgery, or had oral cavity cancer with clinically N0 or N1 neck disease.

### **Ethical Considerations**

Approval was obtained from the institutional scientific and ethical committees before commencement of the study. Written informed consent was obtained from all participants prior to enrolment. Patients were informed about the nature of the study, the clinical assessments involved, the need for follow-up, and their right to withdraw without affecting their treatment.

### **Clinical Assessment and Baseline Evaluation**

All patients underwent a detailed clinical evaluation using a predesigned study proforma. Demographic information, including age, sex, occupation, marital status, socioeconomic background and residential details, was recorded. A detailed history was obtained regarding presenting complaints, duration and progression of disease, previous malignancy, prior

treatment, medical comorbidities, personal habits including smoking, alcohol intake, betel nut and pan chewing, and relevant family history.

General physical examination and systematic head and neck examination were performed in all patients. Particular attention was given to cervical lymph-node assessment, including nodal site, size, consistency, mobility and involvement of other nodal regions. Examination of the oral cavity, oropharynx, nose, ears, larynx and cranial nerves was carried out as clinically indicated. Laryngeal evaluation included assessment of laryngeal crepitus and indirect or fiberoptic laryngoscopy where required.

### **Diagnostic Work-up**

Baseline investigations included routine haematological and biochemical tests, blood grouping, blood glucose estimation, renal function tests, thyroid profile, urine examination, hepatitis B surface antigen and HIV testing. Preoperative evaluation also included electrocardiography and chest radiography.

The local and regional extent of disease was assessed using ultrasonography of the neck, contrast-enhanced computed tomography of the neck and thorax, and ultrasonography of the abdomen where indicated. Cytological or histopathological confirmation was obtained using fine-needle aspiration cytology or trucut biopsy of the cervical lymph node. Immunohistochemistry for Epstein–Barr virus, p16 and human papillomavirus was performed when clinically appropriate. Positron emission tomography was used in selected patients with suspected recurrent disease or where further assessment of disease extent was required.

Endoscopic evaluation, including nasal endoscopy, pharyngoscopy, laryngoscopy, bronchoscopy and oesophagoscopy, was undertaken when indicated to identify the primary site and assess the extent of disease.

### **Treatment Groups**

Patients were classified into the salvage and upfront neck dissection groups according to the treatment strategy received. The salvage group comprised patients undergoing radical neck dissection following persistence, recurrence or failure of prior non-surgical treatment. The upfront group comprised patients undergoing neck dissection as an initial component of management for advanced nodal disease. Subsequent treatment, including radiotherapy or chemoradiotherapy, was recorded as part of the treatment course.

### **Outcome Measures**

The primary outcomes were postoperative wound healing, surgical-site pain, neck stiffness, shoulder stiffness, recurrence and overall prognosis. Wound healing was classified as well healed, delayed healing or wound dehiscence. Dysphagia was also assessed as an important postoperative functional outcome.

Pain at the surgical site, neck stiffness, shoulder stiffness and dysphagia were recorded during follow-up on the basis of clinical assessment and patient-reported symptoms. Recurrence was assessed clinically and through appropriate imaging or pathological confirmation where required. Overall prognosis was documented during follow-up as good or poor, according to the clinical status recorded in the study proforma.

### **Follow-up Protocol**

Patients were followed up at 2 weeks and 4 weeks after surgery, followed by monthly review for up to 1 year. At each follow-up visit, wound healing, postoperative pain, swallowing difficulty, neck and shoulder mobility, treatment-related complications, clinical evidence of recurrence and overall clinical status were assessed.

### **Statistical Analysis**

Data were compiled and analysed as frequencies and percentages for categorical variables. Baseline characteristics, disease-site distribution, postoperative outcomes, recurrence and prognosis were compared between the salvage and upfront neck dissection groups.

The chi-square test was used for comparison of categorical variables. Fisher's exact test was applied where cell frequencies were small or where the assumptions for chi-square testing were not met. A two-sided p value of less than 0.05 was considered statistically significant.

## **RESULTS**

A total of 40 patients with advanced nodal head and neck disease were included in the analysis. Of these, 20 underwent salvage radical neck dissection (RND) and 20 underwent upfront neck dissection. (Figure 1)

### **Baseline characteristics**

The age distribution was not significantly different between the two groups ( $p=0.1518$ ). Patients aged more than 60 years constituted a greater proportion of the salvage RND group than the upfront neck dissection group [11/20 (55.0%) vs 5/20 (25.0%)], whereas patients aged 41–60 years were more frequent in the upfront group [12/20 (60.0%) vs 7/20 (35.0%)].

Male patients accounted for 11 (55.0%) and 15 (75.0%) patients in the salvage and upfront groups, respectively; the difference was not statistically significant ( $p=0.1846$ ).

Disease-site distribution differed significantly between the groups ( $p=0.0005$ ). Carcinoma of unknown primary was the predominant diagnosis in the salvage RND group, accounting for 14 (70.0%) cases. In contrast, oropharyngeal carcinoma was more common in the upfront neck dissection group, accounting for 12 (60.0%) cases. The distribution of laryngeal carcinoma was 15.0% in the salvage group and 30.0% in the upfront group. (Figure 2).

**Table 1. Baseline characteristics of patients undergoing salvage radical neck dissection and upfront neck dissection**

Characteristic	Salvage RND (n=20)	Upfront neck dissection (n=20)	p-value
<b>Age group, years</b>			0.1518
20–40	2 (10.0)	3 (15.0)	
41–60	7 (35.0)	12 (60.0)	
>60	11 (55.0)	5 (25.0)	
<b>Sex</b>			0.1846
Male	11 (55.0)	15 (75.0)	
Female	9 (45.0)	5 (25.0)	
<b>Disease site</b>			0.0005
Larynx	3 (15.0)	6 (30.0)	
Carcinoma of unknown primary	14 (70.0)	2 (10.0)	
Oropharynx	3 (15.0)	12 (60.0)	

*Values are expressed as n (%).*

#### Postoperative healing and functional outcomes

Postoperative wound healing differed significantly between groups ( $p=0.0339$ ). Delayed healing was observed in 16 (80.0%) patients in the salvage RND group compared with 8 (40.0%) patients in the upfront neck dissection group. Conversely, well-healed wounds were documented in 10 (50.0%) patients undergoing upfront neck dissection compared with 3 (15.0%) patients undergoing salvage RND. Wound dehiscence occurred in 1 (5.0%) and 2 (10.0%) patients in the salvage and upfront groups, respectively.

Dysphagia was reported in 8 (40.0%) patients in the salvage group and 4 (20.0%) patients in the upfront group; this difference was not statistically significant ( $p=0.1681$ ). Surgical-site pain was significantly more frequent after salvage RND, affecting 16 (80.0%) patients, compared with 5 (25.0%) patients in the upfront group ( $p=0.0015$ ).

Neck stiffness was reported by 9 (45.0%) patients in the salvage group and 4 (20.0%) patients in the upfront group ( $p=0.0914$ ). Similarly, shoulder stiffness was observed in 7 (35.0%) and 3 (15.0%) patients, respectively ( $p=0.1444$ ). Although both neck and shoulder stiffness were more frequent following salvage surgery, neither difference reached statistical significance. (Figure 3).

**Table 2. Postoperative healing and functional outcomes**

Outcome	Salvage RND (n=20)	Upfront neck dissection (n=20)	p-value
<b>Wound healing</b>			0.0339
Wound dehiscence	1 (5.0)	2 (10.0)	
Well healed	3 (15.0)	10 (50.0)	
Delayed healing	16 (80.0)	8 (40.0)	
Dysphagia	8 (40.0)	4 (20.0)	0.1681
Surgical-site pain	16 (80.0)	5 (25.0)	0.0015
Neck stiffness	9 (45.0)	4 (20.0)	0.0914
Shoulder stiffness	7 (35.0)	3 (15.0)	0.1444

*Values are expressed as n (%).*

#### Recurrence and follow-up outcomes

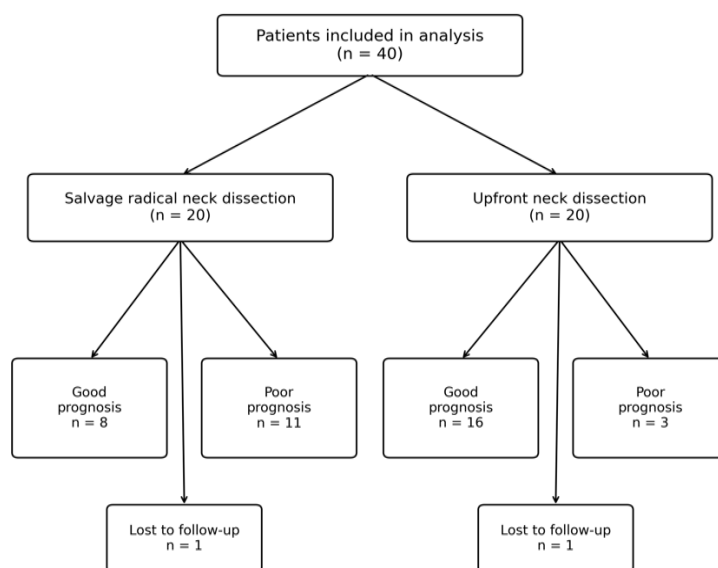
Recurrence was documented in 12 (60.0%) patients in the salvage RND group compared with 4 (20.0%) patients in the upfront neck dissection group. This difference was statistically significant ( $p=0.0098$ ).

At follow-up, a good prognosis category was recorded in 8 (40.0%) patients in the salvage group and 16 (80.0%) patients in the upfront group. A poor prognosis category was recorded in 11 (55.0%) patients who underwent salvage RND, compared with 3 (15.0%) patients who underwent upfront neck dissection. One patient in each group was lost to follow-up. The overall distribution of follow-up outcome categories differed significantly between the two groups ( $p=0.0268$ ) (Figure 4).

**Table 3. Recurrence and follow-up outcomes**

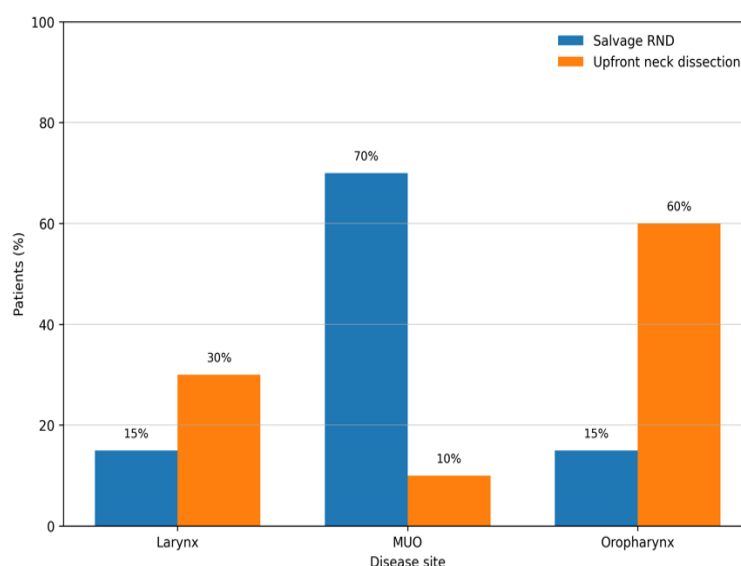
Outcome	Salvage RND (n=20)	Upfront neck dissection (n=20)	p-value
Recurrence	12 (60.0)	4 (20.0)	0.0098
No recurrence	8 (40.0)	16 (80.0)	
<b>Follow-up outcome</b>			0.0268
Good prognosis	8 (40.0)	16 (80.0)	
Poor prognosis	11 (55.0)	3 (15.0)	
Lost to follow-up	1 (5.0)	1 (5.0)	

Values are expressed as n (%).



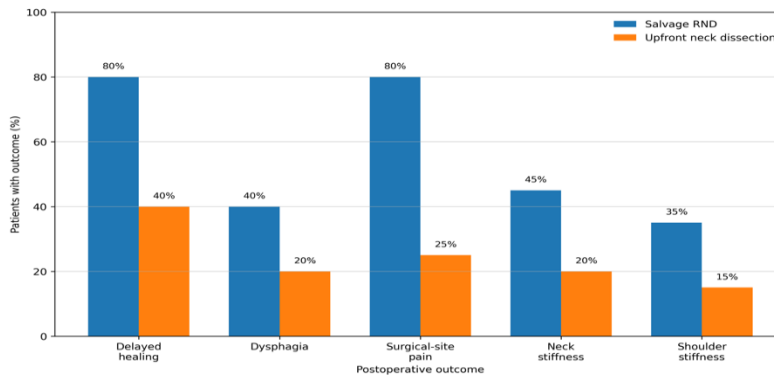
**Figure 1. Study cohort and follow-up outcomes.**

A total of 40 patients with advanced nodal head and neck disease were included in the analysis, with 20 patients each in the salvage radical neck dissection and upfront neck dissection groups. Follow-up outcomes are presented according to the prognosis categories recorded in the study.



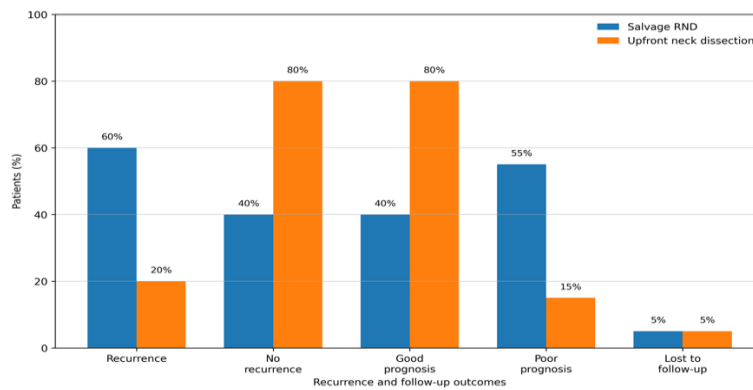
**Figure 2. Distribution of disease site in the salvage radical neck dissection and upfront neck dissection groups.**

Carcinoma of unknown primary was more frequent in the salvage radical neck dissection group, whereas oropharyngeal carcinoma was more frequent in the upfront neck dissection group. The overall disease-site distribution differed significantly between groups ( $p=0.0005$ ).



**Figure 3. Comparison of postoperative morbidity between salvage radical neck dissection and upfront neck dissection groups.**

The figure presents the proportions of patients with delayed wound healing, dysphagia, surgical-site pain, neck stiffness and shoulder stiffness. Delayed healing and surgical-site pain were significantly more frequent in the salvage radical neck dissection group.



**Figure 4. Comparison of recurrence and follow-up outcomes between salvage radical neck dissection and upfront neck dissection groups.**

Recurrence was more frequent in the salvage group than in the upfront neck dissection group (60.0% vs 20.0%;  $p=0.0098$ ). A good prognosis category was recorded more frequently in the upfront group, whereas poor prognosis was more frequent in the salvage group ( $p=0.0268$ ). Recurrence and follow-up outcomes are displayed as separate outcome domains.

## DISCUSSION

This comparative study evaluated outcomes following salvage radical neck dissection (RND) and upfront neck dissection in patients with advanced nodal head and neck disease. The principal findings were that delayed wound healing, surgical-site pain, recurrence and poor follow-up outcome categories were significantly more frequent in the salvage RND group. Conversely, well-healed wounds and a good prognosis category were more commonly recorded among patients undergoing upfront neck dissection.

Delayed wound healing was observed in 80.0% of patients undergoing salvage RND compared with 40.0% in the upfront group, while well-healed wounds were documented in 15.0% and 50.0% of patients, respectively. This difference is clinically plausible, as salvage procedures are commonly performed in previously treated fields where radiation-related fibrosis, microvascular compromise, tissue oedema and altered surgical planes can impair wound repair<sup>[8]</sup>. Salvage surgery in head and neck cancer is recognised to carry substantial postoperative morbidity, particularly when prior chemoradiotherapy has affected tissue viability and healing capacity<sup>[8,9]</sup>.

Surgical-site pain was also significantly more common following salvage RND than upfront neck dissection (80.0% vs 25.0%). Neck stiffness, shoulder stiffness and dysphagia were numerically more frequent in the salvage group, although these differences did not reach statistical significance. These outcomes may reflect fibrosis, scarring and the technical complexity of dissection in a previously treated neck. Functional morbidity after neck dissection may be influenced by tumour extent, the need for sacrifice or manipulation of cervical structures, and treatment-related effects on swallowing and shoulder function<sup>[9,10]</sup>.

Recurrence was significantly more frequent in the salvage group than in the upfront group (60.0% vs 20.0%). Similarly, the good prognosis category was more commonly recorded in the upfront group, whereas poor prognosis was more frequent after salvage RND. These findings suggest that patients requiring salvage surgery represent a clinically vulnerable population, often with persistent or recurrent disease after prior treatment. However, the observed association should not be interpreted as proof that upfront surgery alone improves oncological outcomes. Salvage surgery is generally undertaken in a setting of treatment failure or recurrent disease, and the inherent biology and burden of disease in such patients may independently contribute to recurrence and poor prognosis.<sup>14,81</sup>

The results are consistent with reports that upfront neck dissection, followed by appropriate adjuvant treatment in selected patients with advanced nodal disease, may provide satisfactory regional control while avoiding surgery in an irradiated field <sup>16,71</sup>. Nevertheless, decisions regarding timing of neck dissection should remain individualised and multidisciplinary, taking into account primary site, nodal burden, treatment response, resectability, anticipated functional morbidity and patient preference. In patients undergoing neck dissection after chemoradiotherapy, the timing of surgery may also influence postoperative morbidity. Goguen et al. reported fewer overall and major wound complications when neck dissection was performed 12 weeks or more after completion of chemoradiotherapy, without a significant difference in survival outcomes <sup>111</sup>. This reinforces the importance of careful timing, response assessment and multidisciplinary planning when surgery is considered after non-surgical treatment.

This study is limited by its small sample size, single-centre setting and limited duration of follow-up. The groups also differed significantly in disease-site distribution, which may have influenced postoperative and oncological outcomes. In addition, detailed data on nodal stage, extranodal extension, prior treatment exposure, surgical extent and survival time were not available for adjustment. The prognosis categories were clinically recorded and should not be equated with formal survival outcomes.

## CONCLUSION

In this cohort, salvage radical neck dissection was associated with higher postoperative morbidity, delayed healing, greater surgical-site pain, higher recurrence and less favourable follow-up outcomes than upfront neck dissection. These findings support careful multidisciplinary selection of patients for upfront surgical management where clinically appropriate. Larger prospective studies with standardised outcome definitions, longer follow-up and adjustment for disease-related factors are required to clarify the independent effect of surgical timing on outcomes.

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