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Extent of salvage neck dissection for residual or recurrent cervical nodal disease

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Abstract

Objectives. Salvage neck dissection for squamous cell carcinoma is performed for residual or recurrent nodal disease after chemoradiotherapy or radical radiotherapy for locally advanced head and neck cancer. Our study aims to investigate the extent to which salvage neck dissection can be safely performed in treating recurrent or residual nodal metastasis.

Methods. A retrospective analysis of 53 patients with suspected residual or recurrent nodal disease after primary treatment (January 2016 to December 2018) was performed.

Results. Pathological confirmation of viable squamous cell carcinoma following surgery was found in 43.4 per cent of patients. Post-operative infection, accessory and vagal nerve injuries were more common in patients with dissection of levels I–V than that of levels II–IV. There was no significant difference in three-year survival rate between patients with levels II–IV dissection and that of levels I–V dissection ($p = 0.84$).

Conclusion. The extent of salvage neck dissection can be limited to reduce post-operative complications while maintaining acceptable oncological outcomes.

Main Article

Johannes See Yi Xian takes responsibility for the integrity of the content of the paper

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Introduction

Radical radiotherapy (RT) or combined chemoradiotherapy (CRT) are organ preserving treatment modalities for locally advanced head and neck cancer.[1] Recurrent or persistent nodal metastasis after RT or CRT is common and remains a challenge to successful treatment of these cancers. A study done by ven der Putten *et al.* showed that 129 (23.9 per cent) patients out of a total of 540 patients developed regional recurrence or residues after CRT, with 68 of them who were thought to have unresectable nodal disease.[2] Although most would agree that salvage neck dissections (ND) are required in these circumstances, the extent to which the surgery should be performed lacks evidence. Until recently, dissection of all five neck levels was advocated as the gold standard treatment.[3,4] However, studies on selective ND have reported equal or superior effectiveness with less morbidity when compared to the more radical approach.[2,5-12] The rationale behind this approach is that nodal metastases in head and neck cancers tend to spread in a predictable pattern[13,14] and that the RT or CRT would obliterate the majority of lymph node micrometastases.[15]

Besides selective ND, a few reports on superselective neck dissection (SSND) were published to propose an even more limited ND as a salvage treatment option.[15–17] Although there is no universally agreed definition of SSND, these studies define SSND as removal of all node-bearing tissue of one to two adjacent lymph node levels.[16] A recent study by Okano *et al.* showed that an even targeted single level ND could be considered to lower complication rates while maintaining oncological outcomes.[18] The study evaluated the outcomes of patients who underwent ND of the clinically abnormal levels only without removal of adjacent uninvolved neck levels. The three-year survival rate and disease-specific survival rate were reported as 59 per cent and 66 per cent, respectively, which is in keeping with or superior to studies on selective ND[2,9]

To our knowledge, there is no literature in the United Kingdom that investigates the extent of salvage ND. Therefore, we aim to investigate if selective ND can be safely performed in patients with recurrent or residual nodal metastasis while maintaining acceptable oncological and post-operative outcomes as determined by complications, survival rates and regional control.

Materials and methods

From January 2016 until December 2018, a total of 266 patients with suspected recurrent head and neck cancer were referred to the West of Scotland Head and Neck Cancer Multidisciplinary Team meeting. Only patients with newly diagnosed squamous cell carcinoma (SCC) of the head and neck who were subsequently treated with CRT or RT followed by salvage ND were included in this analysis (n = 53). Exclusion criteria were bone tumours, skin tumours, patients who received surgery only for the original treatment and patients without salvage ND. Of those patients, all 53 patients were subsequently analysed in our study.

All patients were staged according to the TNM 8 AJCC/UICC staging system.[19] RT was carried out 5 days a week with 80 per cent (41/51) of patients receiving 65 Gy in 30 fractions and the total dose ranged from 55 Gy to 66 Gy. The CRT regimen consists of the above regimen with concomitant two cycles of cisplatin (15 patients) or various cycles of cetuximab (4 patients). The date of completion of initial treatment was recorded to identify the time it took for recurrent or persistent neck disease to be detected clinically or radiologically in addition to subsequent survival following salvage ND.

ND was performed if there was equivocal or residual response on post-treatment positron emission tomography–computed tomography (PET-CT) imaging. The types of salvage ND performed were based on recommendation by the multidisciplinary team meetings and the surgical procedures occurred at variable intervals after CRT or RT. The type of ND was defined by the Neck Dissection Classification Update Revisions proposed by the American Head and Neck Society and the American Academy of Otolaryngology-Head and Neck Surgery[20] with the addition of superselective ND (SSND) as defined above. The nodal yield and number of pathologic lymph nodes were recorded.

Post-operative complication rates were recorded in our study including haemorrhage, infection, cranial nerve injury, osteoradionecrosis, Horner's syndrome and admission for pneumonia. We calculated the regional control rate and survival rate on the Kaplan–Meier plot. Values of p less than 0.05 were considered statistically significant for all results of this study.

Local Caldicott Guardian approval was granted, and after consultation with the online HRA Tool,[21] formal ethical review was not required.

Results and analysis

Patient demographics

Fifty-three patients were included. The median age was 59 years (SD 11.1). Most patients were male (44, 83 per cent). Twenty-nine (55 per cent) of the study population were current smokers, and 7 (13 per cent) had never smoked (Table 1).

The most common primary site was larynx (24, 45.3 per cent) followed by oropharynx (13, 24.5 per cent), oral cavity (8, 15.1 per cent), hypopharynx (5, 9.4 per cent), unknown primary (2, 3.8 per cent) and nasopharynx (1, 1.9 per cent). The most common pre-treatment T and N classification in our study population was T2 (22, 41.5 per cent) and N0 (28, 52.8 per cent), respectively (Table 2). Twenty-four patients had initial classification of N1 or above, and 13 (54.2 per cent) of them displayed evidence of extracapsular spread (ECS) on imaging. Human papilloma virus (HPV)/p16 status was recorded in 29 patients, 12 (41.4 per cent) with positive and 17 (58.6 per cent) with negative HPV/p16 status. HPV/p16 status was available in all patients with oropharyngeal cancer, 11 (84.6 per cent) with positive HPV/p16 status. The primary treatment was RT in 27 (50.9 per cent), and 18 (34.0 per cent) patients underwent CRT. The remainder received either surgery followed by RT (7, 13.2 per cent) or surgery followed by CRT (1, 1.9 per cent).

Regarding the nature of recurrence, 10 (18.9 per cent) had equivocal response of nodes on PET-CT following primary treatment, and 38 (71.7 per cent) patients presented with failure of either primary site or nodes. Recurrence was identified through surveillance in five (9.4 per cent) patients.

Table 1. Patient demographics, types of treatment regime and nature of recurrence

Demographics	Patients, n (%)
Male	44 (83%)
Female	9 (17%)
Mean BMI	25.2 (SD 5.1)
Smoking status	
Current	29 (55%)
Previous	17 (32%)
Never	7 (13%)
Type of treatment regime	
Primary RT	27 (50.9%)
Primary CRT	18 (34.0%)
Primary surgery and adjuvant RT	7 (13.2%)
Primary surgery and adjuvant CRT	1 (1.9%)
Nature of recurrence	
Equivocal response of nodes on PET-CT	10 (18.9%)
Nodes identified through surveillance	5 (9.4%)
Failure of primary site and nodes	5 (9.4%)
Failure of primary site only	26 (49.1%)
Failure of nodes only	7 (13.2%)
Method of investigation of recurrence	
Core biopsy proven recurrences	35 (66.0%)
FNA proven recurrences	15 (28.3%)

Table 2. T and N staging of tumour

T classification	Patients, n (%)	N classification	Patients, n (%)
T0	2 (3.8%)	N0	28 (52.8%)
T1	13 (24.5%)	N1	8 (15.1%)
T2	22 (41.5%)	N2a	0 (0%)
T3	9 (17.0%)	N2b	12 (22.6%)
T4	6 (11.3%)	N2c	3 (5.7%)
No records	1 (1.9%)	N3	1 (1.9%)
		No records	1 (1.9%)

BMI = body mass index; CRT = combined chemoradiotherapy; FNA = fine needle aspiration; PET-CT = positron emission tomography–computed tomography imaging; RT = radical radiotherapy

Salvage ND data

Of the 53 neck dissections performed, 62 per cent33 of the patients had tumour resection of the primary site in combination with the ND. A total of 42 per cent[22] of the ND were bilateral ND. In our study, dissection of neck levels II–IV was the most prevalent procedure (20, 37.7 per cent) (Table 3).

Pathologic features

Pathologic examination of the dissected lymph nodes confirmed the presence of positive SCC in 43.4 per cent[23] of the

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Table 3. Nodal levels dissected and corresponding pathological features

Nodal levels dissected	Number of patients	Number of patients with pathologic lymph nodes	Mean number of nodes excised per level	Number of patients with bilateral neck dissection
I, II, III, IV, V	13	7	6.01	3
I, II, III, IV	8	3	6.34	3
II, III, IV, V	3	3	3.88	1
I, II, III	3	3	4.83	1
II, III, IV	20	4	9.05	13
V	1	1	2.00	0
II, III, IV, VI, VII	1	1	4.38	1
II, III, IV, VII	1	0	7.75	0
III, IV, VI, VII	1	0	5.00	0
II, III, VI	1	0	4.00	0
II, III	1	0	3.50	0

patients. 20 (37.7 per cent) patients had evidence of ECS or extranodal extension (ENE) in the resected specimen. The median number of nodes dissected per patient was 25, which ranged from 2 to 107 nodes. In patients with an equivocal nodal response on PET-CT, the rate of ND with viable SCC was 70 per cent (7/10 patients).

Post-operative complications

The most common complications after salvage ND were wound infection (13, 24.5 per cent), admission after surgery with pneumonia (12, 22.6 per cent), evidence of aspiration on videofluoroscopy (6, 11.3 per cent) and haemorrhage (5, 9.4 per cent). Post-operative infection, injuries to the accessory (15.4 per cent) and vagal (7.7 per cent) nerves were more common in patients with dissection of levels I–V than patients with dissection of levels II–IV (Table 4).

In patients who did not have viable SCC in their dissections (n = 30), the complication rate was 43.3 per cent (13/30). For patients with cancer identified in their dissections, the complication rate was 69.6 per cent (16/23).

Outcomes

The three-year overall survival rate was 50.9 per cent. Overall survival was not significantly different for patients with levels II–IV dissection and patients with levels I–V dissection ($p = 0.52$) (Figure 1). The three-year survival rate of HPV-positive patients (78.6 per cent) was better than HPV-negative patients (52.9 per cent) ($p = 0.13$). Patients with positive lymph nodes on pathologic examination experienced worse three-year survival outcome (21.7 per cent) than those without positive lymph nodes (56.7 per cent) ($p = 0.01$). Patients with evidence of ECS or ENE had a poor survival rate (20.0 per cent) compared with patients with pathological lymph nodes without evidence of ECS or ENE (100.0 per cent) ($p = 0.03$).

Table 4. Post-operative complication rates comparing dissection of levels I–V and levels II–IV

Complication	Patients, n (%) from dissection of levels I–V (n = 13)	Patients, n (%) from dissection of levels II–IV (n = 20)
Haemorrhage	1 (7.7%)	0 (0%)
Infection	3 (23.1%)	4 (20.0%)
Accessory nerve injury	2 (15.4%)	0 (0%)
Hypoglossal nerve injury	0 (0%)	2 (10.0%)
Vagal nerve injury	1 (7.7%)	0 (0%)
Osteoradionecrosis	1 (7.7%)	1 (5.0%)
Horner's syndrome	0 (0%)	0 (0%)
Evidence of aspiration on videofluoroscopy	1 (7.7%)	3 (15.0%)
Admission post salvage neck dissection with pneumonia	3 (23.1%)	2 (10.0%)

Discussion

Extent of ND

Our study clearly demonstrated that selective ND produces less post-operative complications than radical ND while maintaining three-year survival outcome as the traditional gold standard treatment. Dissection of levels II–IV had a three-year survival rate of 60 per cent, which is comparable to that seen of other studies by van der Putten *et al.*,[2] Dhiwakar *et al.*[9,22] and Okano *et al.*[18] (Table 5).

When comparing between dissection of levels II–IV and levels I–V only without resection of primary site, our results showed that post-operative infection, accessory nerve injury and vagal nerve injury were more common in patients with radical ND than selective ND.

- Salvage neck dissection for squamous cell carcinoma is performed for residual or recurrent nodal disease after chemoradiotherapy or radical radiotherapy for locally advanced head and neck cancer
- Selective ND produces less post-operative complications than radical ND
- No significant difference exists in overall three-year survival rate between patients with levels II–IV dissection and that of levels I-V dissection ($p = 0.84$)
- More than half (56.6 per cent) of the dissections did not demonstrate the presence of viable squamous cell carcinoma (SCC) in lymph nodes
- Positive human papilloma virus (HPV) status, absence of pathologic lymph nodes and absence of extracapsular spread (ECS) or extranodal extension (ENE) were associated with an increased three-year survival after salvage neck dissection

Pathologic features

More than half (56.6 per cent, 30/53) of the dissections did not demonstrate the presence of viable SCC in lymph nodes. A total of 73.9 per cent (17/23) of patients had pathological lymph nodes in levels II and III only, which suggests most nodal metastasis involves these two neck levels first before spreading to other neck levels. Interestingly, several studies on post-RT or post-CRT ND also revealed a large proportion of dissections with no proven evidence of nodal metastases after histopathological examination.[2,5,6,8–12,15,16,23,24]

Of the 28 patients with an original staging of N0, 5 (17.9 per cent) of them had positive lymph nodes after salvage ND. Only 1 of these patients (20.0 per cent) survived over

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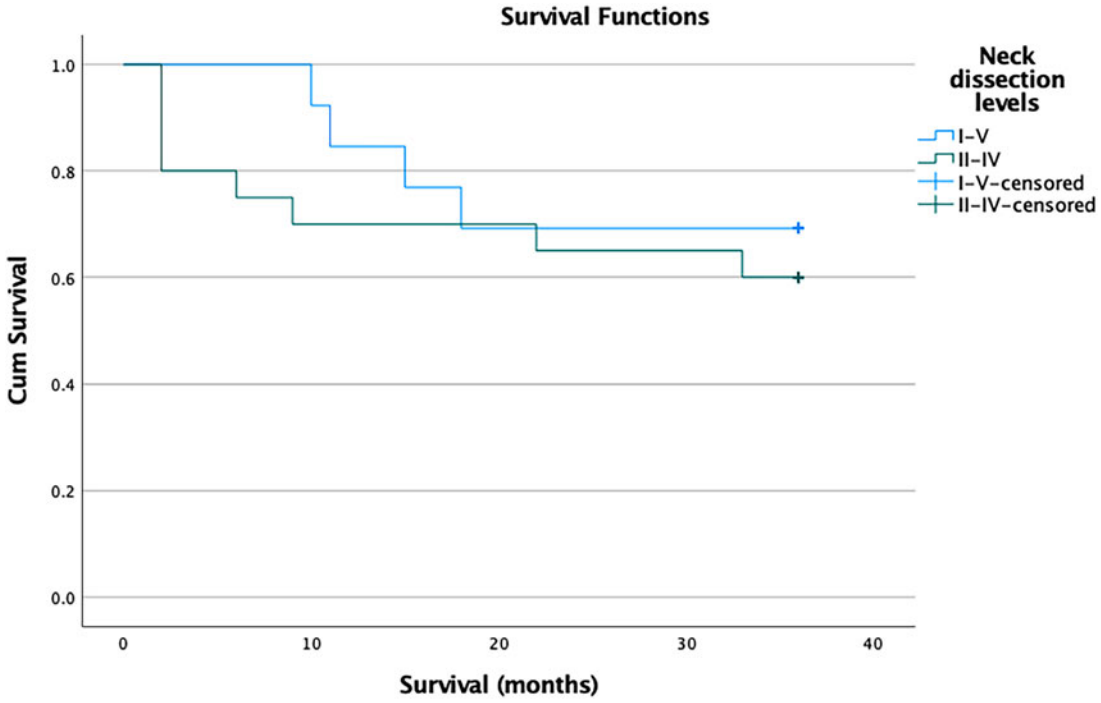

Figure 1. Overall survival following salvage ND according to two groups of different levels of ND

Table 5. Comparison of three-year overall survival rates between different studies on selective ND

Studies	Procedures	Three-year overall survival rate (%)
This study	53	60
van der Putten *et al.*[2]	42	50
Dhiwakar *et al.*[9]	69	60
Dhiwakar *et al.*[22]	25	35
Okano *et al.*[18]	28	59

three years compared to 14 patients (14/23, 60.9 per cent) who were N0 on original staging and without positive lymph nodes after salvage ND.

Nodal yield has been shown in studies to impact survival rates in treatment naïve patients.[25–27] Ebrahimi *et al.*[25] and de Kort *et al.*[26] concluded that the dissection should include at least 18 lymph nodes, whereas Merz *et al.*[27] had suggested that the removal of at least 15 lymph nodes was enough to improve survival. In our study, the median number of nodes dissected per patient was 25. Ebrahimi *et al.*[25] showed that there was no survival difference with increased number of dissected levels although mean nodal yields were increased in patients with more levels dissected.

Factors that affect survival rate

Our study showed that positive HPV status, absence of pathologic lymph nodes and absence of ECS or ENE were associated with an increased three-year survival after salvage ND. Positive HPV status, in particular, has been shown to be a positive prognostic factor in head and neck cancers.[28–30]

Limitations

Due to the specific nature of this study, we had a small sample size of 53 patients over three years which limits the value of statistical analysis. As we have a relatively small sample size, we included patients who underwent primary site resection and salvage ND simultaneously, which could affect the reliability of our analysis on the extent of neck dissection. Another limitation is that we included patients with various initial treatments, such as RT, CRT, primary surgery followed by RT and primary surgery followed by CRT. Our study was conducted retrospectively, which limited data collection.

Conclusion

In conclusion, our study demonstrated that selective ND reduces post-operative complications while maintaining similar survival rate when compared with more extensive dissections.

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References

1 Paleri V, Urbano TG, Mehanna H, Repanos C, Lancaster J, Roques T, *et al.* Management of neck metastases in head and neck cancer: United Kingdom National Multidisciplinary Guidelines. *J Laryngol Otol* 2016;**130**:S161–9

2 van der Putten L, van den Broek GB, de Bree R, van den Brekel MWM, Balm AJM, Hoebers FJP, *et al.* Effectiveness of salvage selective and modified radical neck dissection for regional pathologic lymphadenopathy after chemoradiation. *Head Neck* 2009;**31**:593–603

3 Murthy V, Kundu S, Budrukkar A, Gupta T, Laskar SG, Krishnatry R, *et al.* Salvage neck dissection after chemoradiation in head and neck cancer: Practice and pitfalls. *Int J Head Neck Surg* 2012;**3**:15–21

4 Lavertu P, Adelstein DJ, Saxton JP, Secic M, Wanamaker JR, Eliachar I, *et al.* Management of the neck in a randomized trial comparing concurrent chemotherapy and radiotherapy with radiotherapy alone in resectable stage

https://doi.org/10.1017/S0022215124001452

III and IV squamous cell head and neck cancer. *Head Neck* 1998;**19**:559–66
5 Stenson KM, Haraf DJ, Pelzer H, Recant W, Kies MS, Weichselbaum RR, *et al.* The role of cervical lymphadenectomy after aggressive concomitant chemoradiotherapy. *Arch Otolaryngol Head Neck Surg* 2000; **126**:950-6
6 Hoch S, Bohne F, Franke N, Wilhelm T, Teymoortash A. Extent of salvage neck dissection in advanced oro- and hypopharyngeal cancer. *Anticancer Res* 2016;**36**:981–6
7 Barzan L, Talamini R, Franchin G, Pin M, Silvestrini M, Grando G, *et al.* Effectiveness of selective neck dissection in head and neck cancer: The experience of two Italian centers. *Laryngoscope* 2015;**125**:1849–55
8 Doweck I, Robbins KT, Mendenhall WM, Hinerman RW, Morris C, Amdur R. Neck level-specific nodal metastases in oropharyngeal cancer: Is there a role for selective neck dissection after definitive radiation therapy? *Head Neck* 2003;**25**:960–7
9 Dhiwakar M, Robbins KT, Vieira F, Rao K, Malone J. Selective neck dissection as an early salvage intervention for clinically persistent nodal disease following chemoradiation. *Head Neck* 2012;**34**:188–93
10 Yeung AR, Liauw SL, Amdur RJ, Mancuso AA, Hinerman RW, Morris CG, *et al.* Lymph node-positive head and neck cancer treated with definitive radiotherapy: Can treatment response determine the extent of neck dissection? *Cancer* 2008;**112**:1076–82
11 Cannady SB, Lee WT, Scharpf J, Lorenz RR, Wood BG, Strome M, *et al.* Extent of neck dissection required after concurrent chemoradiation for stage IV head and neck squamous cell carcinoma. *Head Neck* 2010;**32**:348-56
12 Mukhija V, Gupta S, Jacobson AS, Eloy JA, Genden EM. Selective neck dissection following adjuvant therapy for advanced head and neck cancer. *Head Neck* 2009;**31**:183–8
13 Lindberg R. Distribution of cervical lymph node metastases from squamous cell carcinoma of the upper respiratory and digestive tracts. *Cancer* 1972;**29**:1446–9
14 Li XM, Wei WI, Guo XF, Yuen PW, Lam LK. Cervical lymph node metastatic patterns of squamous carcinomas in the upper aerodigestive tract. *J Laryngol Otol* 1996;**110**:937–41
15 Robbins KT, Doweck I, Samant S, Vieira F. Effectiveness of superselective and selective neck dissection for advanced nodal metastases after chemoradiation. *Arch Otolaryngol Head Neck Surg* 2005;**131**:965-9
16 Robbins KT, Shannon K, Vieira F. Superselective neck dissection after chemoradiation-feasibility based on clinical and pathologic comparisons. *Arch Otolaryngol Head Neck Surg* 2007;**133**:486-9.
17 Robbins KT, Dhiwakar M, Vieira F, Rao K, Malone J. Efficacy of superselective neck dissection following chemoradiation for advanced head and neck cancer. *Oral Oncol* 2012;**48**:1185–9
18 Okano W, Hayashi R, Matsuura K, Shinozaki T, Tomioka T. Extent of salvage neck dissection following chemoradiation for locally advanced head and neck cancer. *Head Neck* 2021;**43**:413-18
19 Zanoni DK, Patel SG, Shah JP. Changes in the 8th edition of the American Joint Committee on Cancer (AJCC) Staging of Head and Neck Cancer: Rationale and Implications. *Curr Oncol Rep* 2019;**21**:52
20 Robbins KT, Clayman G, Levine PA, Medina J, Sessions R, Shaha A, *et al.* Neck dissection classification update: Revisions proposed by the American Head and Neck Society and the American Academy of Otolaryngology-Head and Neck Surgery. *Arch Otolaryngol Head Neck Surg* 2002;**128**:751-8
21 NHS Health Research Authority. What approvals and decisions do I need? Health Research Authority 2017. https://www.hra.nhs.uk/approvals-amendments/what-approvals-do-i-need/
22 Dhiwakar M, Robbins KT, Rao K, Vieira F, Malone J. Efficacy of selective neck dissection for nodal metastasis with involvement of nonlymphatic structures. *Head Neck* 2010;**33**:1099–105
23 Goguen LA, Posner MR, Tishler RB, Wirth LJ, Norris CM, Annino DJ, *et al.* Examining the need for neck dissection in the era of chemoradiation therapy for advanced head and neck cancer. *Arch Otolaryngol Head Neck Surg* 2006;**132**:526-31
24 Boyd TS, Harari PM, Tannehill SP, Voytovich MC, Hartig GK, Ford CN, *et al.* Planned postradiotherapy neck dissection in patients with advanced head and neck cancer. *Head Neck* 1998;**20**:132-7
25 Ebrahimi A, Zhang WJ, Gao K, Clark JR. Nodal yield and survival in oral squamous cancer. *Cancer* 2011;**117**:2917–25
26 de Kort WWB, Maas SLN, Van Es RJJ, Willems SM. Prognostic value of the nodal yield in head and neck squamous cell carcinoma: A systematic review. *Head Neck* 2019;**41**:2801–10
27 Merz S, Timmesfeld N, Stuck BA, Wiegand S. Impact of lymph node yield on outcome of patients with head and neck cancer and pN0 neck. *Anticancer Res* 2018;**38**:5347–50
28 Clark JM, Holmes EM, O'Connell DA, Harris J, Seikaly H, Biron VL. Long-term survival and swallowing outcomes in advanced stage oropharyngeal squamous cell carcinomas. *Papillomavirus Res* 2019;**7**:1–10
29 Fakhry C, Zhang Q, Nguyen-Tan PF, Rosenthal D, El-Naggar A, Garden AS, *et al.* Human papillomavirus and overall survival after progression of oropharyngeal squamous cell carcinoma. *J Clin Oncol* 2014;**32**:3365–73
30 Ang KK, Harris J, Wheeler R, Weber R, Rosenthal DI, Nguyen-Tan PF, *et al.* Human papillomavirus and survival of patients with oropharyngeal cancer. *N Engl J Med* 2010;**363**:24–35