

REVIEW

Indications and outcomes of superselective neck dissection: A review and analysis of the literature

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Abstract

Superselective neck dissection, defined as dissection of two or less contiguous neck levels, has recently been introduced to reduce surgical morbidity of neck dissection while maintaining favorable oncologic outcomes. The purpose of this review is to report the results of superselective neck dissection when applied to specific settings: the management of regional disease after chemoradiation, head and neck squamous cell carcinoma with clinical N0 necks, and high risk papillary thyroid carcinoma.

KEYWORDS

chemotherapy, head and neck, superselective neck dissection, super-selective neck dissection

1 | INTRODUCTION

Cervical lymphadenectomy is an essential component of surgical management of head and neck squamous cell carcinoma. Crile described the radical neck dissection (RND), which was the standard of care until the 1950s when modifications were created to minimize morbidity. These modifications resulted in what is now called a modified radical neck dissection (MRND), which include resection of lymph nodes in levels I through V with preservation of the sternocleidomastoid muscle, internal jugular vein, and spinal accessory nerve. Subsequently, the selective neck dissection (SND) was introduced which allowed preservation of certain nodal groups. This was widely accepted when it was found to provide similar oncologic results compared to more extensive neck dissections, even for clinically positive neck disease.¹⁻³

A more limited dissection, termed a superselective neck dissection (SSND), was recently proposed to further reduce the morbidity of neck dissection. The superselective neck dissection is defined as a procedure in which the fibroareolar tissue contents of two or less contiguous neck levels are completely removed. Until now, the SSND has been applied to certain settings, specifically treatment of clinical N0 necks and treatment of the neck after chemoradiation. The purpose of this review is to report the evidence in support of SSND for both applications in addition to high-risk papillary thyroid carcinoma.

2 | MATERIALS AND METHODS

A computerized literature search of the Medline database was performed using the following terms: superselective/AND neck/AND dissection/. A separate search was performed using the terms: superselective/AND neck/ AND dissection (Figure 1). Both searches were pooled together and limited to articles written in the English language. Studies which did not define SSND as removal of the fibroareolar contents of two or less neck levels were excluded. Studies which reported a mean follow-up period of less than 24 months were also excluded (Table 1).

Primary outcomes for the studies which included patients who underwent SSND were quality of life scores, overall survival, and rate of regional control. For studies examining use of SSND for cN0 necks, results included rate of occult cervical metastasis. For studies examining SSND as surgical salvage, results included comparison of imaging and pathological results in addition to rates of recurrence.

3 | RESULTS

Ten articles met the inclusion and exclusion criteria, thus forming the basis of this review. Six articles studied SSND in the setting of

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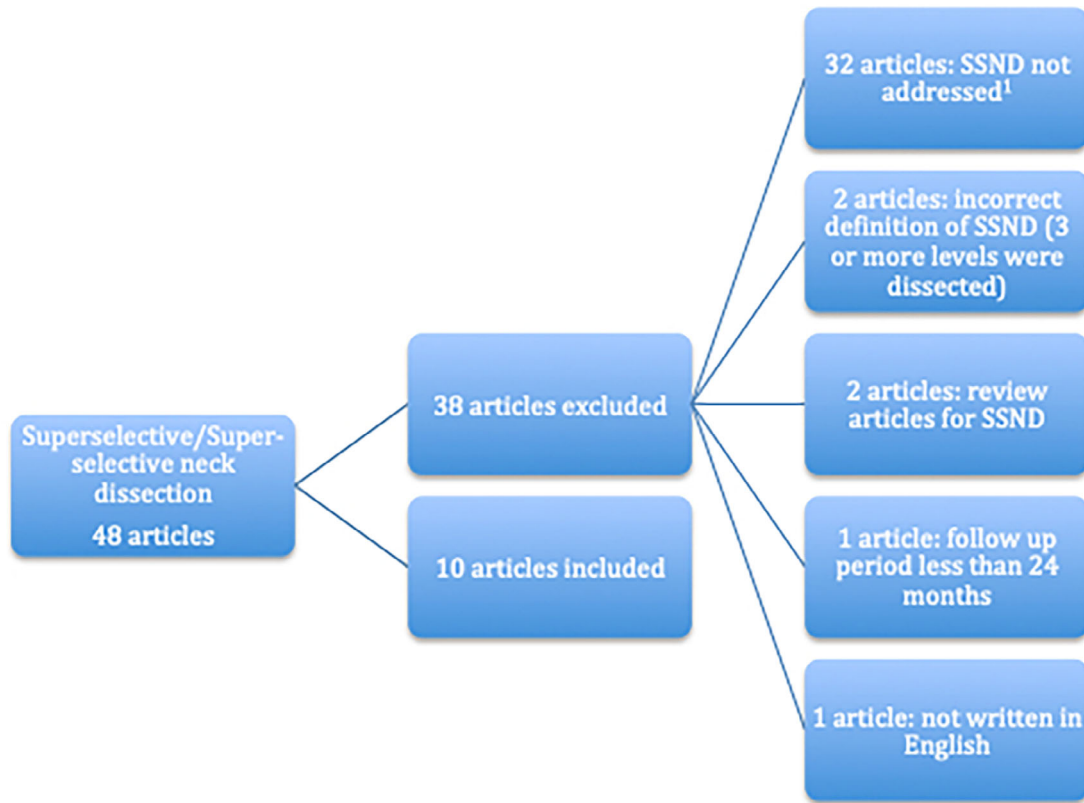


FIGURE 1 The literature search results of the Medline database for superselective and super-selective neck dissection presented with the number and explanation of excluded articles. [†]These articles discussed superselective intra-arterial chemotherapy, superselective embolization, selective neck dissection, and sentinel lymph node biopsy

TABLE 1 Characteristics of included studies are detailed including indications for SSND, outcomes, and results

Article	Indications for surgery	Outcomes	Results
Goguen et al	Incomplete response in the neck after CRT for HNSCC	Predictive value of post-treatment CT	SSND would capture 100% disease with CR, 90% disease in PR to CRT
Robbins, Doweck, et al	Post IA cisplatin + RT for HNSCC	Regional control, distant metastasis, OS	100%, 14%, 46%
Robbins, Shannon, et al	Post IA cisplatin + RT for HNSCC	Post-CRT pathologic nodes	96% in one, predicted level
Robbins, Dhiwakar, et al	Incomplete response vs planned ND after CRT for HNSCC	Local, regional, and distant recurrence	10%, 0%, 17%
Wang, Moon, et al	Deintensified CRT for p16+ OPSCC and UP	QOL Shoulder Score	Extent of ND associated with Shoulder Score ≥ 1 at 1 and 2 years
Wang, Amdur, et al	Deintensified CRT for p16+ OPSCC and UP	Neck Dissection Impairment Index	Associated with number of nodes dissected
Mnejja et al	Laryngeal SCC, cN0	Rate of occult nodes by level	7% IIa, 2.4% IIb, 4.2% III, 2.7% IV
Jia et al	Supraglottic SCC, cN0	Rate of occult nodes in IIa-III vs IIb	31% occult nodes, 0% in IIb
An et al	PTC, high risk of lateral LN metastasis	Occult level III/IV nodes requiring MRND	40% pts required MRND
Kim et al	PTC, suspicious of lateral LN metastasis	Rate of occult nodes	38%, typically level IV

post-chemoradiation or salvage treatment of persistent neck disease. Two articles examined glottic and supraglottic head and neck SCC with clinically negative necks. Two articles applied SSND to

papillary thyroid carcinoma with high risk or suspicion of lateral cervical lymph node metastasis based on clinical and radiologic features.

3.1 | Salvage neck dissection for head and neck SCC

Of the six studies which described SSND for surgical salvage, one was a retrospective case series including patients who received chemoradiation (CRT) for oropharyngeal, laryngeal, hypopharyngeal SCC in addition to SCC of unknown primary.⁴ Three studies were by Robbins et al, two of which included patients with stage III and IV head and neck SCC treated with intra-arterial cisplatin and radiotherapy.^{5,6} The third study combined a cohort from one of the prior studies with a group of patients treated with a variety of CRT protocols.⁷ The remaining two studies by Wang et al were post hoc analyses from two prospective phase II trials in which patients who had p16 positive SCC of the oropharynx or unknown primary with low risk smoking history were treated with deintensified radiotherapy and low dose cisplatin or cetuximab with planned post-treatment surgical evaluation.^{8,9} Superselective or selective neck dissection was performed if residual nodal disease was present.

The studies varied in terms of outcomes. Two studies compared imaging findings after CRT with neck dissection pathology results. In the study by Goguen et al, 104 patients were treated with either sequential or concurrent CRT all with complete response at the primary site. Although SSND was not performed for salvage (only SND, MRND, and RND were performed), SSND would have captured 100% of disease in patients with complete response to CRT and 90% of disease in patients with partial response to CRT.⁴ In the study by Robbins, Shannon et al, 95 patients required salvage neck dissection for residual neck disease after intra-arterial cisplatin and RT. Fifty-four patients had radiographic evidence of residual disease confined to one neck level, and 52 of these had pathologic findings confined to one level.⁵ Therefore, imaging could guide use of SSND for salvage.

Robbins, Doweck et al examined the use of SSND as a therapeutic alternative to a similar group of patients, also treated with intra-arterial cisplatin and RT. Of 171 patients who underwent planned neck dissection for advanced N stage (N2 and N3) or residual disease, only 7 (8%) underwent SSND limited to levels II and III. With a median follow up of 58 months, the rate of regional control was 100% and the rate of distant metastasis was 14% (1/7) compared to 91% and 22% respectively in the SND group. However, the 20-month overall survival for the SSND group was 46% compared to 51% for SND.⁶

Whereas the majority of this group of patients underwent planned neck dissection after CRT, Robbins, Dhiwakar et al, combined this group with an additional cohort of patients who underwent neck dissection after CRT for persistent disease. This study included 30 patients for whom 35 SSNDs were performed. The authors examined recurrence rates as the primary outcome. Over a median follow up period of 33 months, no patients had regional recurrence whereas three patients had recurrence at the primary site and five patients had distant metastases.⁷

Both studies by Wang et al investigated patient reported quality of life outcomes of SSND or SND after de-intensified CRT. Quality of life measures were assessed using the EORTC QLQ-C30 (general), EORTC H&N 35 (head and neck specific), EAT-10 (swallowing), NDII

(Neck Dissection Impairment Index), and UW-QOL Shoulder Scores. 37% of patients had a Shoulder Score > 1 (any shoulder symptoms) whereas 13% of patients had a score > 2 (affecting work and hobbies). An increase in NDII correlated with the number of nodes dissected, but all NDII scores improved with time. The EORTC QLQ-C30, H&N 35, and EAT-10 scores were worse after CRT but continued to improve despite post-treatment neck dissection.^{8,9}

3.2 | Head and neck SCC with clinical N0 neck disease

Two studies described the application of SSND to glottic and supraglottic SCC with clinically negative neck disease. Mnejja et al retrospectively analyzed 41 neck specimens from 32 patients with laryngeal SCC and cN0 necks to determine rate of occult metastasis by neck level. The rates were 7% for level IIa and 4.2% for level III whereas lower rates were found for levels IIb and IV, 2.4% and 2.7% respectively.¹⁰ Jia et al performed a prospective study of 68 patients with supraglottic SCC and N0 necks who were surgically managed with dissections of levels IIa and III. Level IIb specimens were also removed and sent separately at the time of surgery. Of 122 neck dissection specimens obtained from 68 patients, the incidence of occult metastasis was 31% with no positive lymph nodes in IIb.¹¹ Of note, both studies reported an increased rate of occult metastasis with higher T stages.

3.3 | Papillary thyroid carcinoma

The remaining two studies evaluated the efficacy of SSND in patients with high risk of or suspicious lateral cervical lymph node metastasis. An et al enrolled patients with high risk features including nodules > 2 cm, extrathyroidal extension, and enlarged cervical lymph nodes found on either ultrasound or CT but with negative fine needle aspiration. Each patient underwent SSND of levels III, IV, in addition to central compartment dissection (level VI), and the contents of the SSND were sent separately for frozen section analysis with conversion to MRND if positive. Of 146 neck dissections performed in 138 patients, 55 cases required conversion to MRND.¹²

Kim et al studied patients with clinically suspicious lateral neck nodes and performed SSND on 34 patients. Although preoperative FNA was only performed for 5 patients, 13 patients (38%) had positive pathologic nodes with the most frequent site of involvement in level IV.¹³ Both studies used the same thyroidectomy incision to complete the SSND, and the incision was only extended if a more extensive neck dissection was required.

4 | DISCUSSION

Superselective neck dissection is described as dissection of only one or two contiguous nodal stations primarily to reduce the morbidity of

neck dissection. Indications for SSND have been discussed for management of cN0 necks and post CRT neck dissections. In the salvage or post CRT setting, the studies described in this review have concluded that computed tomography imaging correlates well with pathologic results in terms of involvement of particular nodal stations. Although PET/CT was not specifically evaluated in these studies, recent data supports the use of PET/CT to determine the need for salvage surgery after CRT—particularly in oropharyngeal SCC. Studies have indicated a high negative predictive value and lower positive predictive value and, therefore, more potential for false positive cases (positive imaging with negative pathologic results).^{14,15} For patients with a complete response on post treatment PET/CT, neck dissection has not shown improvement of regional recurrence rates compared to patients who continue observation.^{15,16}

In two studies by Robbins, Robbins, Doweck et al and Robbins, Dhiwakar et al,^{6,7} SSND was performed in the post-CRT setting. Both studies reported regional control rates of 100% thus confirming similar oncologic outcomes to more extensive neck dissections. In one cohort of patients, however, most SSNDs were planned in patients who had complete response to treatment. As planned post-treatment neck dissections do not improve outcomes compared to post treatment PET/CT¹⁶ and NCCN guidelines recommend PET/CT 12 weeks after treatment to assess whether observation or salvage neck dissection would be appropriate, additional studies incorporating current guidelines are needed to apply SSND to the post treatment setting.

Additional studies reporting quality of life outcomes demonstrated that worse NDII scores were associated with a higher number of lymph nodes that were dissected. Therefore, SSND could be performed safely for post CRT patients with similar oncologic outcomes and less morbidity.

With regard to the surgical management of cN0 necks in HNSCC, two studies included in this review described laryngeal and supraglottic SCC for which levels II and III were dissected.^{10,11} Levels IIb and IV were shown to have much lower rates of occult metastasis, and thus SSND could also be effective in this setting. Of note, SSND of levels I and II has been described for oral cavity SCC with cN0 necks. Two studies found on the initial search were randomized control trials which studied cN0 early stage oral cavity SCC; however, the definition of SSND in both studies were levels I-III with only the exclusion of level IIB. This did not meet the criteria of the true definition of SSND, and therefore, both studies were excluded from the review.

Sentinel lymph node biopsy (SLNB) has also been studied for management of cN0 necks in early stage oral cavity and oropharyngeal SCC. Loree et al studied oral cavity SCC with cN0 necks in 108 patients and found a sensitivity of 75% and negative predictive value of 91%.¹⁷ A retrospective analysis of the National Cancer Data Base reported reduced hospital stay and morbidity of SLNB patients compared to elective neck dissection, with no significant difference in overall 3 year survival.¹⁸ It would be informative to perform similar analyses with SSND although there are limitations as it not used as widely as SLNB. The benefits of SLNB are the ability to identify unexpected, including contralateral, lymphatic drainage pathways whereas

the risks include false negative results. The success of SLNB can also vary based on the surgeon and the technique used. These are considerations when weighing the option of SLNB against SSND and SND.

Although all the studies in this review concluded that SSND is a safe and efficacious alternative to more invasive neck dissections, SSND was only performed in six of the ten studies. Both studies describing papillary thyroid carcinoma with high risk of lateral cervical node metastasis used SSND in their protocols and both concluded it could be used as an alternative technique to MRND, which would require longer incisions. However, both studies do not adhere to the current ATA guidelines. An et al described patients with thyroid nodules > 2 cm as high risk¹² and Kim et al did not perform preoperative ultrasound guided fine needle aspiration of suspicious lymph nodes.¹³ It is therefore problematic to apply SSND to papillary thyroid carcinoma on the basis of these studies. Furthermore, any case of papillary thyroid carcinoma with high risk of lateral cervical node metastasis would require central compartment neck dissection in addition to lateral neck dissection which includes more levels than defined by a SSND. Central compartment neck dissection was performed in both studies, but the SSND specimen were analyzed separately and thus included in this review.

5 | CONCLUSION

The reviewed studies suggest that SSND can be used safely in certain settings. With the ability of preoperative radiography to predict involvement of specific nodal stations, SSND could be applied to the management of post-chemoradiated necks with favorable oncologic outcomes and reduced morbidity provided that additional, current evidence support this. In early stage HNSCC with cN0 necks, studies demonstrated a lower rate of occult metastasis beyond the expected nodal levels, thus allowing for a more limited neck dissection. When reviewing the studies which included patients who underwent SSND for papillary thyroid carcinoma, current ATA guidelines were not applied. For post-chemoradiation SSNDs, many but not all patients had already achieved complete response to CRT, which also did not apply to current NCCN guidelines. Although these studies suggest the efficacy of SSND, studies which apply SSND to current guidelines are required with analysis of long term outcomes.

CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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