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Neck Dissection Through a Facelift Incision

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Objectives/Hypothesis: To determine the feasibility and safety of neck dissection through a facelift incision.

Study Design: Prospective case series.

Methods: Cadavers and live subjects underwent neck dissection using a facelift incision with and without endoscopic assistance. In the live facelift neck dissection (FLND), the preoperative surgical indications, staging, adjuvant therapy, intraoperative technical procedure, pathology reports on lymph nodes, and short-term outcomes were reviewed.

Results: FLND was successfully performed in four cadavers and four live subjects, including selective (less than five neck levels removed) and comprehensive (levels I–V removed) neck dissections. All levels were accessible through this approach, with additional retraction required for levels I and IV. Endoscopic assistance was required in one neck dissection for adequate visualization. Short-term complications and number of excised lymph nodes were comparable to those from traditional neck dissection approaches.

Conclusions: Open neck dissection through a facelift incision is feasible and offers an alternate approach to traditional incisions. This can be performed without requiring robotic assistance and with endoscopic assistance only in certain cases. Endoscopic assistance can offer enhanced visualization of the surgical field and complement open direct approaches in neck dissection. Although FLND offers improved cosmetic outcomes when compared to those of traditional neck incisions, further study is required to determine its efficacy and indications.

Key Words: Facelift, neck dissection, cosmetic, radical, modified, selective, comprehensive, approach, rhytidectomy, minimally invasive.

Level of Evidence: 4

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INTRODUCTION

The need for improved cosmetic outcomes has become increasingly emphasized in head and neck surgery. In the past 20 years, advancements in minimally invasive techniques have allowed for better cosmetic outcomes and reduction in surgical morbidity.[1] Along with the advent of endoscopically and robotically assisted procedures, more attention has been placed on smaller and more hidden incisions and on the use of natural orifice[2] approaches.

Within the field of thyroid and parathyroid surgery, endoscopically[3–7] and robotically assisted[8–10] procedures have substantially grown, allowing for alternative, smaller, or even complete avoidance of neck incisions. These methods have become widely accepted and have opened doors for central neck dissection approaches using small or no neck incisions that have comparable oncologic outcomes and similar complication rates for well-differentiated thyroid cancers.[11–14] However, it is also important to stress that some of the supposedly minimally invasive approaches mentioned above are not truly less invasive; some of the approaches are actually more invasive than traditional direct open neck approaches. The scarless (in the neck) endoscopic thyroidectomy is one example of a maximally invasive procedure that leads to desirable neck cosmesis at the cost of more soft tissue dissection, increased postoperative pain, and longer operative times.[15] Robotically assisted thyroidectomy through a facelift incision has also been recently described as a feasible and safe approach for certain thyroid diseases.[16]

Outside of central neck surgery, the submandibular gland excision has been performed through a transoral endoscopic approach,[17] as well as in human cadavers using two 15-mm submandibular skin incisions.[18] Minimally invasive head and neck surgery has proved to be useful in the excision of benign lesions including submandibular masses, branchiogenic cysts, frontal tumors, frontozygomatic cysts, and epidermoid nasal cysts[19,20] and recently has evolved to be demonstrably feasible and safe with outcomes similar to those of conventional procedures for malignant disease.[21] Unilateral endoscopic selective[22] (less than five neck levels removed) neck dissections have been successfully performed in

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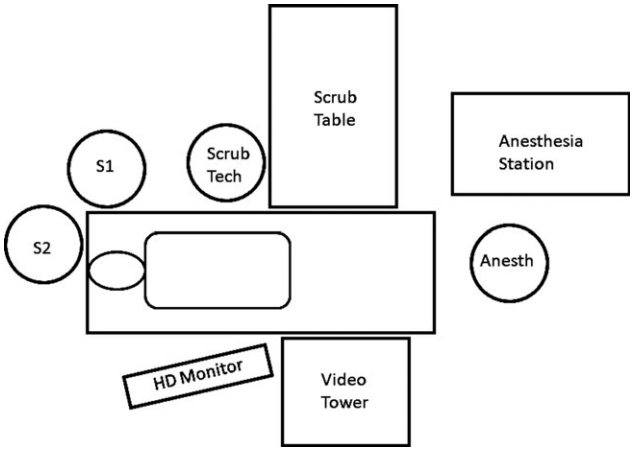


Fig. 1. The operating room layout for endoscopically assisted portions of a left facelift neck dissection (FLND). A surgeon (S1) and surgical assistant (S2) are needed for endoscopic portions of the FLND. For level I dissection, S2 could serve as the scope-holder, and S1 would serve as primary surgeon, and this configuration can be interchanged for level IV dissection. HD = high definition.

live pigs with[23] and without[24] carbon dioxide insufflation. For benign parotid masses amenable to extracapsular dissection, the standard modified Blair incision can be replaced with a minimally invasive retroauricular hairline incision without compromise of surgical visualization.[25]

The application of minimally invasive approaches to lateral neck lymph node dissection has been limited. Robotically assisted neck dissections for well-differentiated thyroid cancer have been performed through transaxillary incisions with limited access to levels I, IIB, and VA.[26] To improve access for robotically assisted comprehensive[22] (neck levels I–V removed) neck dissections for squamous cell carcinoma, the same group further demonstrated feasibility of such a procedure using a retroauricular together with an axillary incision.[27]

Despite these advances, the oncologic neck dissection continues to be performed most commonly through standard anterolateral cervical skin incisions. Head and neck surgeons are frequently faced with the difficulty of prioritizing and balancing oncologic control, functional results, quality of life, and cosmetic outcomes in treating patients. We present our initial experience in the feasibility of performing the open facelift neck dissection (FLND).

MATERIALS AND METHODS

Approval was obtained from the Greater Baltimore Medical Center Institutional Review Board. Four cadaver necks and four live neck dissections were performed through facelift incisions. Dissections were performed both with and without endoscopic assistance.

Cadaver dissections were performed, initially, to determine if FLND was feasible, to refine the surgical technique, and to examine potential sites of injury. Cadavers with intact arterial and venous systems injected with colored latex for enhanced arterial and venous visualization were obtained from the Maryland State Medical Examiner according to institutional approval. All cadavers underwent bilateral FLND in the same setup and dissection period. Another surgeon inspected the resection site to determine completeness of the resection and to look for injury to important structures.

In live subjects, the preoperative surgical indications, staging, adjuvant therapy, intraoperative technical procedure, pathologic lymph node results, and short-term outcomes were reviewed. The lymph nodes obtained from the live subjects who underwent the FLND technique were compared to historical controls of traditional neck dissections performed by the same surgeons at the Greater Baltimore Medical Center from 2009 to 2011. Statistical analyses of lymph node numbers were performed using nonparametric Wilcoxon rank-sum tests or Kruskal–Wallis analyses of variance (ANOVAs) with significance defined as $P < .05$.

Operative Technique

The patients were positioned for surgery in a standard fashion. Because in some cases endoscopic assistance was used for portions of the dissection, setup was designed to allow the possibility of endoscopy as seen in Figure 1.

The facelift incision extended from the anterior border of the tragus, around the lobule, and continued postauricularly 4.5 cm inferiorly along the hairline (Fig. 2). The postauricular hairline incision was beveled to minimize the damage to hair follicles. The skin flap was elevated forward until the lateral border of the sternocleidomastoid (SCM) muscle was encountered. The greater auricular nerve was identified and preserved. A subplatysmal flap in continuity with the skin flap was raised using a lighted breast retractor and extended length



Fig. 2. Facelift left neck dissection incision.

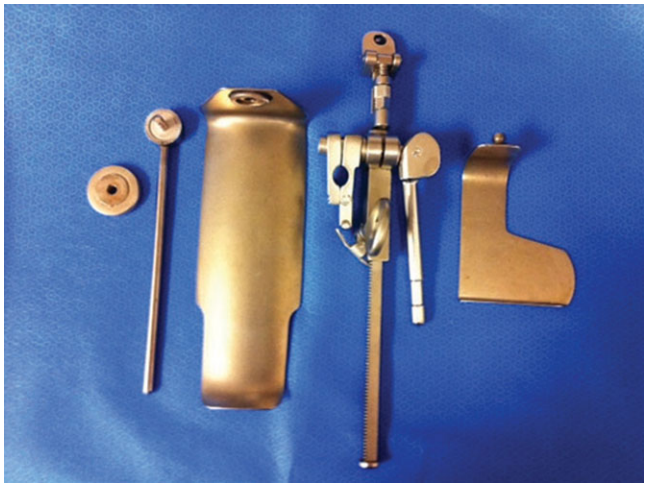


Fig. 3. Thompson retractor system with ultra blades.

guarded electrocautery tip. Care was taken to not injure the cervical branch of the facial nerve. Levels IIA, IIB, III, VA, and VB were dissected and were either removed en bloc or per lymph node level. The General Thompson retractor system with Thompson ultra blades (Fig. 3) were used to expose the operative site providing static retraction, which was especially useful in the dissection of levels I and IV. These levels, most distant from the incision, were the most difficult to dissect using the facelift approach.

If endoscopic assistance was used to provide better illumination and magnification during the dissection of levels I and IV, a 5-mm 0° rigid endoscope was typically used with a surgical assistant holding and directing the scope. Jackson–Pratt drains were placed in all cases and removed within 2 to 5 days postoperatively after meeting the criteria of <20 cc per 24 hour period. Lymph nodes and their respective levels were divided according to American Joint Committee on Cancer guidelines.

RESULTS

Cadaver Dissections

All four cadaver dissections were carried out in the above-described operative technique. Preauricular extension was needed for the cadaver dissections due to lack of compliance in the fixed tissues. Although levels I and IV were the most difficult to dissect given their distal position relative to the facelift incision, the cadaveric dissections did not require assistance of an endoscope. Static retraction was achieved using the Thompson retractor set. There were no gross injuries to the marginal mandibular nerve, hypoglossal nerve, spinal accessory nerve (CN XI), internal jugular vein (IJV), sensory rootlets, vagus nerve, or carotid artery. A 7-mm skin perforation while raising the subplatysmal flap was observed in one of the four cadavers. On gross examination, all lymph nodes levels were adequately removed.

Live Dissections

All four live patients underwent neck dissection through a facelift incision (Table I).

Case 1

HB was a 56-year-old man with a T2N2bM0 tonsillar squamous cell carcinoma previously treated with chemoradiation therapy to both the primary site and neck. He underwent a salvage FLND due to a progressively enlarging right neck recurrence. Gross disease was found in right neck levels IIA, IIB, and VA with involvement of the IJV and the SCM with close approximation but not encapsulation of CN XI. An FLND was performed at levels I to V, sacrificing the IJV and the SCM, but sparing CN XI. Lymph nodes were removed en bloc and then divided (Fig. 4). A small puncture site in the supraclavicular region was used to pass instruments aiding in the dissection of inferior level IV. Only a single drain was used, and the puncture site served as the drain site at the end of the case.

Case 2

PW was a 56-year-old man with a history of previously resected lower lip squamous cell carcinoma. Due to suspicion of recurrent metastatic disease in the left neck based upon positron emission tomography/computed tomography findings, he underwent a left FLND removing

TABLE I.
Live Subjects Who Underwent Facelift Neck Dissection.

Characteristic	Case 1	Case 2	Case 3	Case 4
Age/gender	56/male	56/male	44/male	55/male
Weight/BMI	74.8 kg/25.1	108 kg/32.3	96.1 kg/30.4	83.9 kg/27.3
TNM staging	T2N2bM0	TXN1M0	T1N2aM0	T1N1M0
Prior radiation	Yes	No	No	No
Incision	Facelift	Facelift	Extended facelift	Facelift
Neck dissection	Levels I–V sacrificing IJV and SCM, sparing CN XI	Levels I–IV	Levels I–V sacrificing IJV, SCM, and CN XI	Levels II–IV
Endoscopic assistance	No	Yes	No	No
Positive lymph nodes	1 with ECS of 11	1 of 42	1 with ECS of 45	1 of 17
Operative time	2 hours, 30 minutes	2 hours, 50 minutes	2 hours, 20 minutes	2 hours, 45 minutes
Postoperative complications	Temporary marginal mandibular nerve weakness	Temporary shoulder weakness	Temporary marginal mandibular nerve weakness, shoulder weakness	None

BMI = body mass index; SCM = sternocleidomastoid; CN XI = spinal accessory nerve; ECS = extracapsular spread.

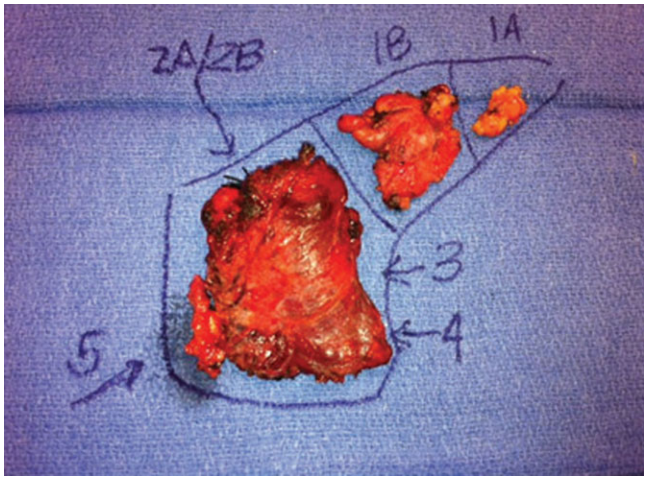


Fig. 4. Lymph node specimen in a right radical facelift neck dissection in Case 1.

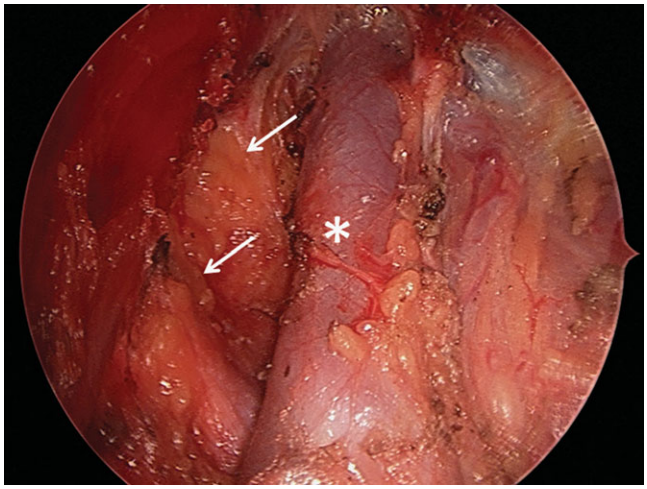


Fig. 6. Endoscopic view from Case 2 of postdissection left levels III and IV, sensory rootlets (arrows), and internal jugular vein (*).

levels I, IIA, III, and IV per level, sparing IJV, SCM, and CN XI (Figs. 5 and 6), and a right anterolateral incision neck dissection for levels I to V, sparing IJV, SCM, and CN XI. There was no gross disease noted during the operative procedure. Endoscopic assistance was particularly useful for level I due to inadequate direct visualization during this case. One drain was used at the end of the case. This patient underwent postoperative radiation.

Case 3

BF was a 44-year-old man who presented with a T1N2aM0 squamous cell carcinoma of the left tonsil. He underwent transoral robotic surgery (TORS) excision of the primary lesions followed by FLND levels I to V, sacrificing the SCM, IJV, and CN XI, along with dissection into the deep neck musculature. There was extensive involvement of all sacrificed structures including invasion into the deep musculature. The intraoperative



Fig. 5. Case 2, 3 months after operation. This subject underwent right traditional anterolateral skin crease incision for neck dissection at levels I through V, sparing all structures, the same day he underwent left facelift neck dissection at levels I through IV, sparing all structures. (A) Anterior view. Both the right (C) and the left (B, D) neck incisions were closed in a multilayer fashion using glue for skin. The left facelift incision (B, D) is well hidden in the hairline even in this man with short hair.

TABLE II.
Lymph Nodes Level by Level in a Facelift Neck Dissection Versus Standard Neck Dissection.

Neck Level	Facelift ND	Standard ND	*P*
I	3.33 ± 2.08	3.78 ± 2.67	.48
II	12.0 ± 9.56	9.32 ± 5.50	.62
III	2.75 ± 1.26	8.71 ± 4.88	.01
IV	2.25 ± 1.50	8.41 ± 5.71	.01
V	7.00 ± 9.90	8.00 ± 4.70	.17

Statistical significance was defined as $P < .05$.
ND = neck dissection.

decision was made to extend the vertical limb of the postauricular incision from 4.5 to 7 cm long based on the extensive disease involving approximately a 4 × 2 cm area of the deep neck musculature. A CN XI neurorrhaphy was performed at the end of the case. The patient received postoperative chemotherapy and radiation. One drain was used at the end of the case.

Case 4

GB was a 55-year-old man who presented with T1N1M0 squamous cell carcinoma of the left tonsil. Clinical examination noted a 7-mm mass in glossotonsillar sulcus. The subject underwent TORS and FLND at levels II to IV, sparing the SCM, IJV, and CN XI. One drain was placed at the end of the case. This patient underwent postoperative radiation.

Short-Term Postoperative Course

Cases 1 and 2 were discharged home on postoperative day 1 after receiving physical therapy instructions for shoulder range of motion. Cases 3 and 4 were not discharged until postoperative day 2 due to inadequate early oral intake following TORS. Immediate postoperative complications were limited to mild temporary marginal mandibular (cases 1 and 3) or CN XI (cases 2 and 3) nerve weakness. There were no oropharyngeal complications in the TORS cases.

Lymph Node Comparison

To evaluate adequacy of dissection, the lymph nodes excised per level were analyzed and compared to historical controls of comprehensive and selective neck dissections performed by the same surgeons. The number of lymph nodes per level, averaged across all levels, for facelift, selective, and comprehensive neck dissections were 5.4 ± 2.8, 7.7 ± 2.0, and 7.6 ± 3.0, respectively. A three-way Kruskal–Wallis ANOVA showed no significant difference ($P = .29$). A level-by-level pairwise comparison between FLND (n = 4 subjects) and historical controls (n = 40 subjects; Table II) showed no difference in levels I, II, and V (Wilcoxon rank-sum test). The FLND group did, however, show lower lymph node numbers for levels III and IV ($P = .01$).

DISCUSSION

We demonstrate the feasibility of performing a neck dissection through a facelift incision. Using this technique, a neck dissection can be performed in an open manner through direct visualization, with only limited endoscopic assistance. The FLND cosmetic outcome may be preferred to traditional and more visible anterolateral neck incisions and therefore has the potential to offer a cosmetic advantage (Fig. 5).

In the era of growing minimally invasive surgical techniques, reduction of known morbidities associated with neck dissection is desirable for patients, particularly if equivalent oncologic outcomes can be achieved. The facelift incision reduces the known morbidity of visible neck scarring. The facelift incision has been described in thyroid lobectomy,[16,28] where the extension afforded by the long arms of the robot allows for a central neck procedure to be done from a lateral well-concealed neck incision in a safe and effective manner. The facelift incision in conjunction with an axillary incision allows for adequate access to the lateral neck.[27] A similar approach for neck dissection but through a facelift incision alone, with or without endoscopic assistance, has not been systematically investigated.

Pre- and Intraoperative Considerations

In considering a facelift approach, one must take into account patient factors that influence the ease or oncologic success of the operation. A patient with a particularly long or obese neck may present additional challenge for the dissection in the submental and supraclavicular regions. The live cases presented were all overweight, with body mass indexes >25 kg/m^2 (Table I). Disease extent is also of primary importance. In the live cases, dissection was successful for a spectrum of grossly bulky disease. Only in one case did the facelift incision have to be lengthened to gain access to tumor involvement of the deep neck musculature. Dissection of levels IIA/B and VA were assisted by their close proximity to the incision. However, bulky disease in level I or low in level IV would likely prove a challenge through this approach. Conversely, patients with radiated necks, such as in case 1, who may be at higher risk for dehiscence and great vessel exposure, may benefit from this approach, as it does not place the incision directly superficial to the carotid artery.

Intraoperatively, additional retraction is required for adequate exposure. Lifting the subplatysmal flap can be arduous in the facelift approach. Lifting this flap can be started using traditional methods, but the use of longer instruments, such as the lighted breast retractor, is important for good visualization and illumination as the flap lengthens with elevation. Lymph node dissection similarly requires additional retraction for exposure. The Thompson retractor system allows adequate access while freeing the operative assistant to assist with dissection, hemostasis, or scope holding. This system offers versatility with the different available retractors to adapt to specific exposure needs of the case. Even with the best retraction, however, the most distal dissection

can prove to be challenging to visualize. It is in these areas, particularly levels I and IV, where endoscopic assistance can be useful by providing improved lighting and magnification. Intraoperative arrangement of primary and secondary surgeons can alternate depending on whether operating at level I or IV (Fig. 1).

Disadvantages

Of the live cases performed in this series, the FLND does not require use of a surgical robot, likely reducing the complexity, duration, and cost of the procedure. However, the primary disadvantage to the facelift incision is the difficult anterior exposure and the resulting possible need for endoscopic equipment and long instruments to access levels I and IV in particular. The incision is relatively posterior and therefore creates more distance from the incision to reach these levels. Due to the occasional need for lengthened reach and magnification, endoscopes used freely or through robotic technology with long arms and three-dimensional high-definition imaging can serve an important role in difficult cases. However, in this current series endoscopic assistance was not required the majority of the time and, although ready for use, the surgical robot was not needed for any of the cases.

Additional disadvantages include the concern for postoperative complications more common to cervicofacial rhytidectomy, the most common of which is the development of hematoma.[29] This complication is minimized with meticulous hemostasis and use of postoperative drains. Neither hematomas nor seromas were present in any of the four live cases presented. Risk of skin necrosis, auricular nerve paresthesia, postrhytidectomy contracture, and auricular deformity are possible additional complications of FLND compared to other more traditional incisions. The duration of surgery was on average 1 hour longer than that of neck dissections through a traditional incision. This was in part due to the use of additional equipment and lack of familiarity with the operating setup. These are inefficiency issues that occur with most novel surgical approaches and are expected to decrease with increased repetition.

Postoperative Considerations

The postoperative courses of the live subjects were similar to those of subjects who have undergone standard neck dissection. The duration of drain use after FLND was similar to that of neck dissections performed through traditional neck incisions. The overall numbers of lymph nodes obtained were similar between techniques. The average number of lymph nodes per level obtained by FLND, 5.4, is similar to that noted in others' series (4.4–5.3).[30] Although significant differences were noted for levels III and IV, and level III is often an important lymphatic drainage site for many head and neck tumors, important factors should be considered in the interpretation. The sample size is this study is small ($n = 4$). Other factors such as tissue processing, labeling of neck levels in the specimen, number of lymph nodes after radiation, and inter-rater variability between different pathologists reviewing the specimen may also have affected the results. Our analysis is limited by these factors, and to better study the overall oncologic outcome of this procedure, a prospective randomized controlled clinical trial comparing FLND to anterolateral incision neck dissections should be carried out, which is beyond the scope of this feasibility study. Future longitudinal studies would also help examine oncologic efficacy.

CONCLUSION

It is feasible and safe to approach neck dissections, whether selective or radical, through a facelift incision. This approach is versatile and offers a well-hidden scar and therefore a potentially more desirable cosmetic result than that of conventional incisions without necessitating robotic assistance, although it may require additional endoscopic assistance for full visualization in some cases. Further studies are needed to understand the limitations and indications of the technique as well as the long-term oncologic outcomes.

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