Review Article

Submandibular Gland Reduction in the Modern Necklift Surgery: A Systematic Literature Review

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Abstract

Submandibular gland prominence can undermine aesthetic outcomes in neck and lower face rejuvenation, even after deep-plane facelifts and platysmaplasty. In selected patients, gland reduction has emerged as an effective adjunct to improve cervicomental contour. In this systematic review, the authors analyze 51 studies involving 2971 patients undergoing submandibular gland reduction across 6 surgical approaches, including transcervical, necklift-integrated, intraoral, retroauricular, endoscopic, and robotic-assisted techniques. The overall complication rate was 15.1%, with marginal mandibular nerve injury being most common (9.8%). Minimally invasive methods, particularly endoscopic and intraoral, showed lower hematoma rates and faster recovery with high patient satisfaction. Retroauricular approaches yielded excellent aesthetic outcomes but had the highest nerve injury rates. LigaSure-assisted and partial reductions reduced bleeding and preserved function. Despite generally favorable results, variation in technique, outcome reporting, and patient selection limits broader adoption. Standardized protocols and prospective studies are needed to optimize safety, aesthetic benefit, and long-term results in submandibular gland contouring for facial rejuvenation.

Level of Evidence: 3 (Therapeutic)

Definition of the mandibular and cervicomental angles is a critical component of facial harmony and in achieving the perception of youth.[1-3] Because techniques in lower face and neck rejuvenation have advanced, plastic surgeons have increasingly recognized the limitations of traditional rhytidectomy and platysmaplasty in addressing persistent submandibular fullness.[1,4] In particular, hypertrophy or ptosis of the submandibular glands may compromise the ideal neck contour, even in otherwise successful face and neck lifts.[5] In fact, even a modern deep-plane approach to the neck may result in more pronounced fullness by counterintuitively emphasizing the patient's hypertrophic gland. In such cases, submandibular gland reduction has emerged as a targeted intervention to refine the cervical silhouette by directly addressing one of its deepest and most pronounced structural contributors.[1,4]

Submandibular gland reduction in the context of aesthetic surgery is not without complication, primarily because of risks of neurovascular injury or iatrogenic sialocele and variation in surgical technique.[5-7] Because submandibular contouring has become more popular, many techniques have emerged; however, there is no consistent approach with emphasis on safety and reliability in the dissection and reduction of this structure. Nevertheless, in selected patients, the procedure has demonstrated favorable outcomes with complication rates comparable to neck lifts performed without gland reduction.[4,8] The surgical approach can be tailored according to anatomic considerations and include traditional transcervical reduction, LigaSure-assisted (Medtronic Plc; Dublin, Ireland) reduction for improved hemostasis, minimally invasive endoscopic and robotic-assisted approaches, and partial gland reduction to preserve salivary function while reducing gland bulk.[4,5,7-9] Each method carries specific risks and benefits, including the risk of marginal mandibular nerve injury, sialocele, and rare but serious complications such as hematoma and subsequent airway compression.[4,9]

LigaSure-assisted reduction has been reported to significantly reduce intraoperative bleeding and postoperative hematoma while maintaining a low complication rate, including transient lower lip weakness in a small subset of patients, all of whom recovered fully within 6 months.[5] Endoscopic and robotic-assisted approaches offer promising alternatives that reduce visible scarring and the risk of nerve damage, with favorable outcomes in small patient cohorts.[8,9] Partial gland reduction has been associated with improved aesthetic outcomes and a lower incidence of minor complications such as sialocele and transient nerve weakness.[7]

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Recent studies suggest that submandibular gland reduction can yield high patient satisfaction and meaningful aesthetic improvement, particularly in patients with gland prominence contributing to neck heaviness.[4,7,8] Nonetheless, the widespread adoption of this technique in aesthetic surgery has been limited by variability in surgical technique, inconsistent outcome reporting, and the absence of standardized indications for necessitating such an approach.

The aim of the authors of this review is to evaluate the current literature on submandibular gland reduction in the context of face and neck lift surgery. The authors seek to synthesize existing data on surgical techniques, indications, outcomes, and complications and to propose a standardized framework that can guide safe and effective implementation of submandibular gland management as part of modern facial rejuvenation surgery.

METHODS

Search Strategy

A systematic review of the literature was conducted to identify studies evaluating submandibular gland reduction in the context of aesthetic face and neck lift procedures. The databases MEDLINE (through PubMed, National Library of Medicine, Bethesda, MD), Scopus (Elsevier, Amsterdam, the Netherlands), Embase (Elsevier), and Web of Science (Clarivate, Philadelphia, PA) were searched from inception through April 1, 2025. The search strategy included combinations of the following terms using Boolean operators and, when appropriate, Medical Subject Headings (MeSH): submandibular gland resection, submandibular gland reduction, submandibular ptosis, cervicofacial rhytidectomy, neck lift, facelift, rhytidectomy, platysmaplasty, and deep-plane facelift. No restrictions were placed on study design or publication date. Reference lists of all included full-text articles were manually screened to identify additional studies not retrieved in the initial search. Only peer-reviewed publications were included. Given that this review relied exclusively on previously published data, institutional review board approval was not required.

Study Eligibility

Studies were eligible if they involved human or cadaveric participants undergoing submandibular gland reduction, described a surgical technique in the context of aesthetic or anatomic facial rejuvenation, and reported on surgical outcomes or complications. Studies were excluded if they were case reports, focused solely on imaging, device development, glandular biology, or oncologic and functional indications without relevance to cosmetic surgical applications. Animal studies were excluded.

Study Selection

All titles and abstracts were screened independently by 2 reviewers (R.D. and O.S.). Full texts of potentially relevant articles were reviewed in detail for final inclusion. Discrepancies were resolved by consensus. The selection process adhered to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines.

Data Extraction

A standardized data collection form was utilized to extract study characteristics, including author, year, country, study design, sample size, patient age, surgical technique, adjunctive tools, extent of gland reduction (complete or partial), use of drains, concurrent procedures, selection criteria, and follow-up duration. Complication data included marginal mandibular nerve injury, hematoma, sialocele, seroma, infection, and visible scar formation. Outcomes of interest also included patient satisfaction, objective aesthetic results, salivary function, recovery time, and revision rate.

Surgical Technique Classification

To facilitate analysis, surgical techniques were grouped into 6 predefined categories based on approach: (1) traditional transcervical excision, (2) submental/necklift/facelift-integrated approaches, (3) intraoral or transoral approaches, (4) retroauricular or posterior hairline approaches, (5) endoscopic-assisted transcervical or remote access, and (6) robotic-assisted approaches through various incisions. This classification system is detailed in Figures 1 and 2 and was applied consistently across the review.

Outcome Assessment

Outcomes were independently assessed by 2 authors based on the content of each article. When studies provided objective outcome measures or patient-reported satisfaction scales, these values were normalized to a standardized 5-point scale. In the absence of such metrics, a structured rubric was applied. Outcomes were graded as 5 for excellent (reflecting high patient satisfaction, scarless results, or preserved salivary function), 4 for good (favorable results with minor limitations), 3 for acceptable or neutral (moderate outcomes or trade-offs), 2 for suboptimal (complications that resolved or minor dissatisfaction), and 1 for poor (persistent dysfunction, revision surgery, or explicit patient dissatisfaction). Outcomes not reported or not applicable were excluded from the respective analyses. Cadaveric studies were excluded from the assessment of complication incidence in this review.

Data Analysis

Figures were created by the authors that provided comparative visualizations of complication profiles and aesthetic outcomes by technique group. Complication rates were calculated for each domain and normalized to the group sample size. These rates were compared with the overall cohort average, $\log_2$-transformed, and presented using a grayscale heat map derived from established visualization methodology. Domains analyzed included nerve injury, hematoma, sialocele, seroma, infection, and scar formation. Additional figures were synthesized with the same transformation and visualization framework for patient-centered outcomes, including satisfaction, aesthetic results, salivary function, and recovery time. All data analyses were performed using R software (Vienna, Austria).

RESULTS

A total of 1241 articles were identified through systematic database searches (Figure 3). Following the removal of 524 duplicate records by Covidence, 717 unique studies were screened by title and abstract. Of these, 593 studies were excluded for not meeting inclusion criteria, leaving 124 articles for full-text review. After detailed assessment, 73 studies were excluded because of incorrect study design ($n = 34$), irrelevant outcomes ($n = 14$), inappropriate intervention ($n = 9$), wrong patient population ($n = 9$), incorrect setting ($n = 5$), non-English language ($n = 1$), or unrelated indication ($n = 1$).

Ultimately, 51 studies were included in the qualitative synthesis. These studies represented a range of surgical techniques for

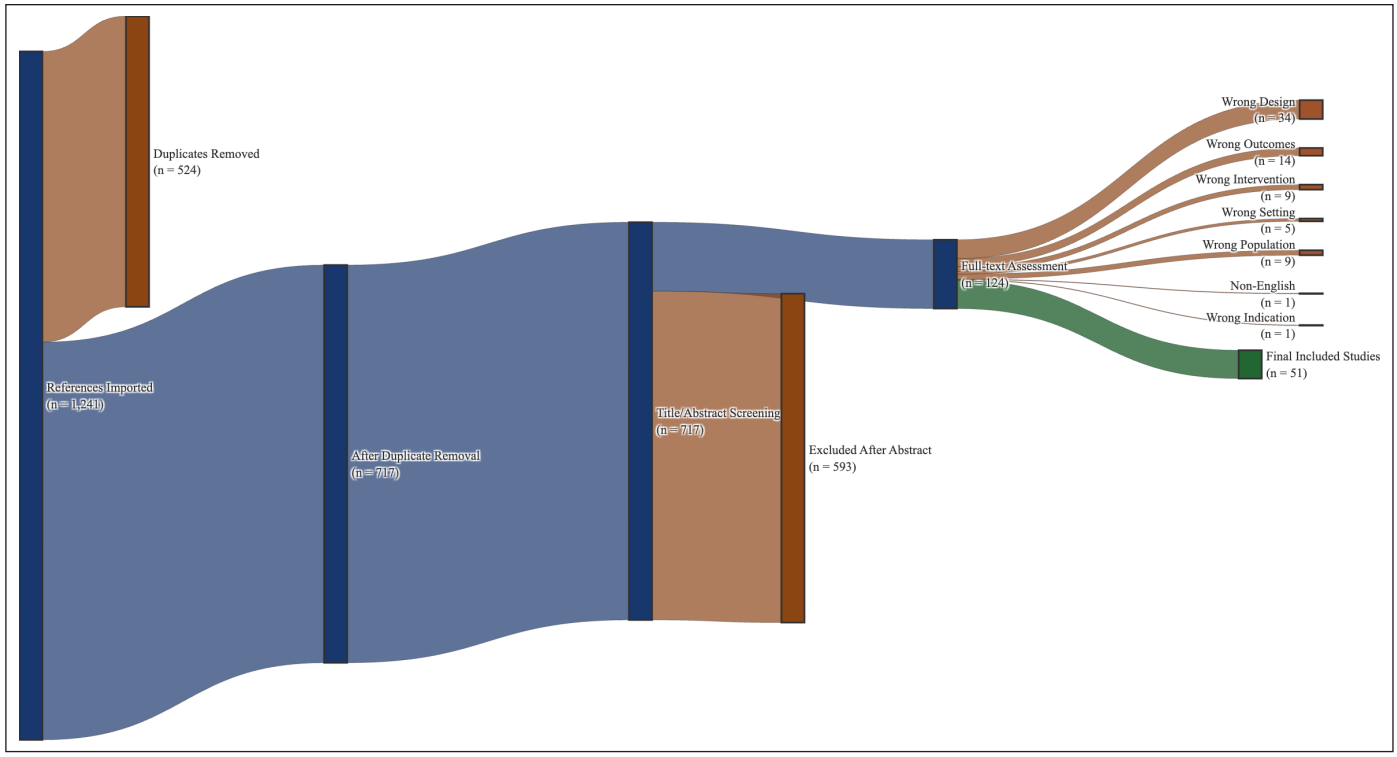

Figure 1. Preferred Reporting Items for Systematic Reviews and Meta-Analyses flow diagram. Flow diagram summarizing the study selection process for inclusion in the systematic review. A total of 1241 articles were identified across 4 databases. After removal of 524 duplicate records using Covidence, 717 studies underwent title and abstract screening. Of these, 124 full-text articles were assessed for eligibility. Seventy-three articles were excluded for reasons including incorrect study design ($n = 34$), inappropriate outcomes ($n = 14$), wrong intervention ($n = 9$), irrelevant population ($n = 9$), unsuitable setting ($n = 5$), non-English language ($n = 1$), or unrelated indication ($n = 1$). Fifty-one studies were included in the final qualitative synthesis.

submandibular gland reduction performed in conjunction with facial rejuvenation procedures. The included articles varied in methodological quality, with most comprising retrospective case series and small cohort analyses. Nearly all studies were published between 2000 and 2025, with a concentration of reports in the last decade. The most common study designs were case series ($n = 28$), followed by comparative studies and prospective cohorts. The characteristics of these studies, including patient demographics, surgical approach, complication profiles, and aesthetic outcomes, are summarized in Supplemental Table 1. The majority of studies originated from Korea ($n = 13$) and the United States ($n = 10$), with additional contributions from 14 other countries (Figure 4).

Complications

Complication profiles varied across surgical approaches to submandibular gland reduction (Figure 1). Among the 2971 patients included, the overall complication rate was 15.1%. Marginal mandibular nerve injury was the most frequently reported complication ($n = 292$, 9.8%), followed by hematoma ($n = 54$, 1.8%), sialocele ($n = 44$, 1.5%), infection ($n = 36$, 1.2%), seroma ($n = 12$, 0.4%), and visible scar formation ($n = 12$, 0.4%).

Traditional transcervical excision ($n = 579$) and submental and necklift-integrated approaches ($n = 1611$) were the most commonly reported techniques, with total complication rates of 11.2% and 11.2%, respectively. The transcervical cohort had a higher incidence of sialocele (3.5%) and marginal mandibular nerve injury (5.5%), whereas the necklift-integrated group had slightly elevated rates of hematoma (1.9%) and nerve injury (6.7%). Intraoral and transoral approaches ($n = 111$) demonstrated a higher overall complication rate of 16.2%, driven by elevated rates of nerve injury (10.8%) and sialocele (3.6%), despite a complete absence of hematoma.

Retroauricular and posterior hairline incisions ($n = 187$) were associated with the highest overall complication rate (41.2%), largely because of a markedly increased rate of marginal mandibular nerve injury (34.8%), which was more than triple the cohort-wide average. Infection (3.7%) and scar formation (1.6%) were also more common in this group.

Minimally invasive strategies, including endoscopic-assisted ($n = 77$) and robotic-assisted approaches ($n = 406$), demonstrated divergent complication profiles. Endoscopic techniques reported a moderate total complication rate (13.0%) with low absolute complication counts. Robotic-assisted reductions, while offering the benefits of remote access and enhanced visualization, demonstrated a higher total complication rate (24.6%), with nerve injury (16.8%) and hematoma (4.4%) as leading contributors. Notably, these procedures reported no cases of sialocele or visible scar formation.

Overall, marginal mandibular nerve injury remained the most significant and technique-sensitive complication, with rates ranging from 5.5% (transcervical) to 34.8% (retroauricular). The data underscore a trade-off between aesthetic access routes and neurovascular safety, reinforcing the importance of tailored technique selection and anatomical precision during submandibular gland surgery. A complete breakdown of complications by technique is presented as a matrix in Figure 1.

Patient Satisfaction and Aesthetic Outcomes

Patient satisfaction was assessed using a 5-point scale across 46 of the 51 included studies; 5 studies did not report sufficient data and

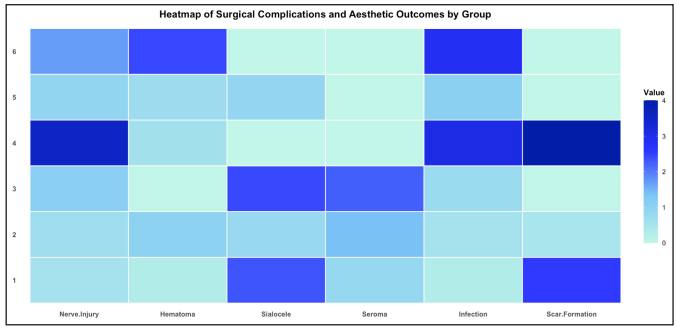

Figure 2. Heat map of complication profiles by surgical technique group. Comparative heat map illustrating the relative frequency of complications across 6 surgical technique categories for submandibular gland resection. The groups correspond to (1) traditional transcervical excision, (2) submental/necklift/facelift-integrated approaches, (3) intraoral/transoral approaches, (4) retroauricular/posterior hairline incisions, (5) endoscopic-assisted transcervical or remote access, and (6) robotic-assisted approaches through various incisions. Complication domains included nerve injury, hematoma, sialocele, seroma, infection, and visible scar formation. Complication rates were calculated as percentages normalized to each group's sample size and compared against the overall cohort average. The resulting values were $\log_2$-transformed to allow for comparative visualization of both above- and below-average complication frequencies. Darker blue cells represent complication rates significantly above the cohort mean, whereas lighter shades indicate rates closer to or below average.

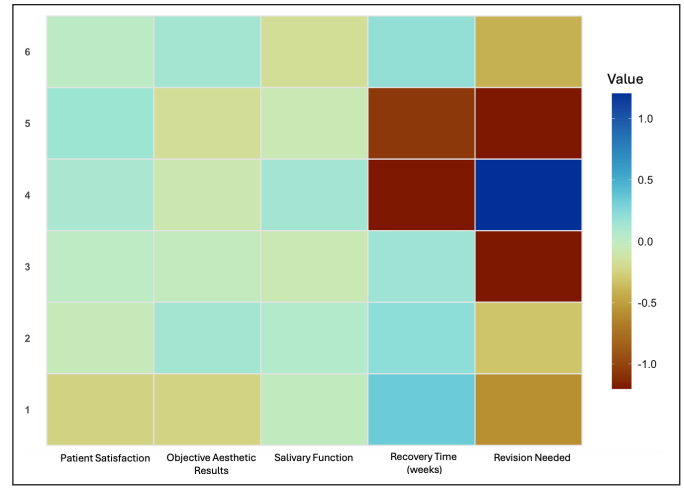

Figure 3. Heat map of satisfaction and functional outcomes by surgical technique group. Comparative heat map displaying aesthetic and functional outcomes across 6 surgical technique groups for submandibular gland resection. Groups correspond to (1) traditional transcervical excision, (2) submental/necklift/facelift-integrated approaches, (3) intraoral/transoral approaches, (4) retroauricular/posterior hairline incisions, (5) endoscopic-assisted transcervical or remote access, and (6) robotic-assisted approaches through various incisions. Domains assessed include patient satisfaction, objective aesthetic results, salivary function, recovery time, and revision rate. Outcome measures were either extracted directly from objective scales or inferred from descriptive data and normalized to a 5-point scale using a structured rubric. Ratings were then averaged for each technique group, compared with the overall cohort mean, and $\log_2$-transformed to facilitate comparative analysis. Higher values (blue) represent performance above average, whereas lower values (brown) indicate outcomes below the cohort mean. Recovery time and revision rate were inverted before transformation such that higher (bluer) scores reflect shorter recovery and fewer revisions.

were excluded from this analysis. Overall satisfaction was high, with a weighted mean rating of 4.26 across all surgical techniques. Retroauricular and posterior hairline approaches yielded the highest satisfaction (4.6), followed closely by endoscopic-assisted (4.75) and intraoral/transoral methods (4.29). Submental or necklift-integrated approaches ($n = 2$) demonstrated consistent results with both high satisfaction (4.13) and consistent aesthetic ratings (4.67).

Traditional transcervical excision scored lower on both satisfaction (3.6) and aesthetic outcome (3.6), although it maintained favorable scores in salivary function preservation and recovery time. Notably, the retroauricular cohort exhibited a markedly higher revision rate (12.5%), despite its strong satisfaction scores (Supplemental Table 2).

Data on objective aesthetic outcomes and salivary function were less consistently reported, with 8 and 12 studies, respectively, missing quantifiable assessments. The lowest revision rates were observed in endoscopic-assisted and intraoral/transoral techniques (0% and 0.9%, respectively), both of which also reported expedited recovery (mean <2 weeks in endoscopic cases). These findings suggest a favorable balance of aesthetic refinement and patient experience with minimally invasive approaches. Full outcome metrics are provided as a matrix in Figure 2. The full dataset of available studies is included in Supplemental Table 3.[10-39]

DISCUSSION

This review synthesizes data from 51 studies evaluating submandibular gland resection as an adjunct to aesthetic facial and neck rejuvenation procedures. Although the majority of included studies were retrospective case series and small cohort reports, the findings consistently demonstrate that submandibular gland resection can meaningfully improve cervicomental contour when performed in appropriately selected patients. Across technique categories, complication rates were generally low and comparable to those reported for standard neck lift procedures, with marginal mandibular nerve injury and sialocele being the most common adverse events.

Our findings underscore that traditional transcervical and submental and necklift-integrated approaches remain the most widely employed techniques, in part because of their reproducibility and direct access to the gland. However, more recent innovations, particularly endoscopic and robotic-assisted approaches, have gained popularity because of their ability to conceal scars and preserve nerve function. For example, Basaran and Comert demonstrated that LigaSure-assisted resection in the context of deep-plane neck lifts was associated with reduced intraoperative bleeding and no major complications across 83 patients.[5] Similarly, transoral and retroauricular techniques, while still limited to select patient populations, offer promising avenues for minimizing visible scarring and improving postoperative satisfaction.[40,41]

Despite these benefits, each emerging technique carries its own complication profile that warrants consideration during surgical planning. Minimally invasive and endoscopic approaches, such as retroauricular endoscope-assisted resections, are associated with subcutaneous emphysema, trocar site infection, and longer operative times. Transoral techniques, while scar-sparing, may result in transient lingual nerve paresthesia and dysphagia, with additional risk of oral wound infection because of the nonsterile operative field.[41,42] Partial gland resections, although effective for preserving function, introduce a higher risk of sialocele formation and transient marginal mandibular nerve weakness.[4,7] These nuanced risks highlight the importance of tailoring the surgical approach to each patient's anatomy, aesthetic goals, and tolerance for specific postoperative morbidities.

Complications

Complication rates varied significantly by technique. Retroauricular approaches showed the highest rate of marginal mandibular nerve injury (34.8%), possibly reflecting the longer learning curve or deeper dissection plane involved.[40,43,44] In contrast, intraoral and endoscopic-assisted techniques demonstrated low rates of hematoma and infection and, in many cases, eliminated the risk of visible cervical scarring. Importantly,

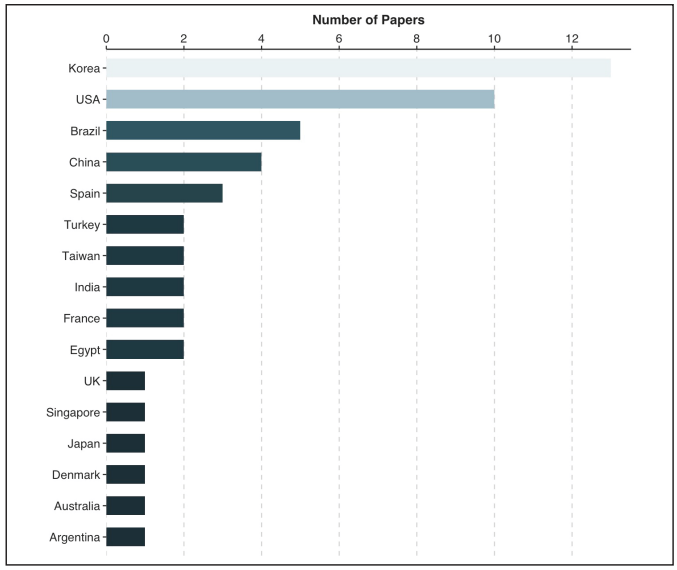

Figure 4. Geographic distribution of included studies by country. Bar graph depicting the number of included studies by country of origin. Among the 51 studies included in the final review, the majority originated from Korea ($n = 13$) and the United States ($n = 10$), followed by Brazil ($n = 5$), China ($n = 4$), and Spain ($n = 3$). The remaining studies were distributed across 11 additional countries, each contributing between 1 and 2 studies.

robotic-assisted procedures offered excellent visualization and access but were associated with higher hematoma rates and longer operative times, suggesting that their role may best be reserved for patients who prioritize cosmesis above all else and are able to tolerate a longer recovery. The risk profile and innovation trajectory of submandibular gland resection techniques closely mirror those of related procedures such as subplatysmal fat removal, digastric muscle reduction, and deep-plane rhytidectomy.[1,8,40,45] Innovations in these procedures, including energy-based vessel sealing, endoscopic assistance, and retroauricular access, have similarly aimed to reduce morbidity and enhance aesthetic outcomes.[1,8]

Reported complication rates for conventional neck lifts, including cervicofacial rhytidectomy with platysma plication, remain low, with hematoma requiring surgical evacuation occurring in roughly 3% to 6% of cases and other adverse events such as skin necrosis or transient nerve symptoms being less frequent and usually self-limiting.[46,47] By comparison, this review finds that aesthetic submandibular gland reduction demonstrates similar complication rates. Most nerve deficits resolve spontaneously, whereas permanent xerostomia is rare.[4,7,48]

Overall, both procedures are considered safe in experienced hands, although submandibular gland (SMG) reduction carries a distinct profile of salivary and nerve-related complications, and a small risk of deep neck hematoma with airway compromise that is not typical of standard neck lifts.[48]

Long-term follow-up data suggest that most nerve injuries after submandibular gland resection, the most common complication documented in this series, represent neuropraxia and recover spontaneously, with permanent deficits being uncommon.[49,50] Early marginal mandibular weakness has been reported in nearly one-fifth (20%) of cases but typically declines to under 3% with extended follow-up, whereas permanent lingual or hypoglossal nerve injury is rare. These findings support that the majority of postoperative nerve palsies are transient, consistent with neuropraxia, with only a small minority progressing to lasting dysfunction. Furthermore, nerve complications associated with minimally invasive and transoral approaches were limited to transient neuropraxia, whereas transcervical techniques carried a higher risk of persistent deficits.[5,41,42,45,51] Careful facial preservation and limited nerve manipulation enhanced recovery.

Injury to the cervical branch of the facial nerve during SMG surgery is exceedingly rare, with transient marginal mandibular paresis far more common (5.7-18.7%) and permanent injury typically <1%.[6,49,50,52,53] Anatomic studies confirm cervical branch involvement only in isolated cases (1.4% of glands), underscoring that the marginal mandibular branch remains the principal structure at risk.[6] In contrast, injury to branches of the deep cervical plexus, most notably the transverse cervical nerve, although exceedingly rare, can complicate the interpretation of postoperative deficits. Because this nerve may anastomose with the marginal mandibular branch of the facial nerve, its injury can mimic true marginal palsy, producing sensory changes or transient "pseudo-paralysis" of the lower lip.[54,55] Awareness of these variants is important for both surgical planning and accurate postoperative assessment, as true marginal mandibular injury is typically permanent, whereas pseudo-paralysis from cervical nerve involvement is more likely to resolve.[56]

Moreover, bleeding complications after SMG surgery are uncommon but clinically relevant, with hematoma or reoperation for bleeding reported in roughly <5% of cases.[48,49,52] Endoscopic and minimally invasive techniques demonstrate particularly low blood loss owing to enhanced visualization and technically precise dissection, whereas extracapsular or partial resections further reduce intraoperative bleeding compared with total excision.[45,57-59]

Finally, xerostomia remains an important functional outcome, given the submandibular glands' contribution to resting salivary flow. Rates vary widely across studies, with subjective dry mouth reported in 21% to 57% of patients and consistent objective reductions in unstimulated salivary output; gland-preserving procedures substantially mitigate this risk.[49,58,60-63]

Given the variety of potential complications, protocols for early complication identification must be tailored to the selected technique. For example, minimally invasive and endoscopic procedures require serial postoperative assessments for hematoma, seroma, and facial nerve injury, with a low threshold for airway monitoring because of the potential for deep neck bleeding.[5] Transoral approaches demand routine evaluation of lingual nerve function, tongue mobility, and signs of oral cavity infection, particularly within the first 72 h.[8,41,42] For partial gland resections, surveillance for sialocele formation and lower lip symmetry should be standard.[5,7,48] Adjunctive medications, such as prophylactic antibiotics and botulinum toxin, also introduce specific risks, including gastrointestinal upset and rare allergic reactions or muscle weakness, necessitating careful monitoring during follow-up.[48]

Despite these advances, there is still no standardized approach to submandibular gland management in aesthetic surgery. Variability in technique, outcome reporting, and patient selection remains a barrier to broader adoption.[48] In this review, we highlight that the majority of studies lacked objective aesthetic endpoints or validated patient-reported outcome measures. Furthermore, complications such as sialocele, marginal nerve paresis, and the need for revision were inconsistently defined or omitted entirely in several reports.

Future Directions

Emerging strategies aim to balance functional preservation with improved contour. Partial gland resection, described in several studies including those by Auersvald, Bravo, and Benslimane, demonstrated high satisfaction with lower rates of xerostomia and postoperative morbidity.[1,7,64]

Adjunctive tools, such as botulinum toxin injection and internal suspension techniques (eg, hemostatic netting or platysma corseting), are also under investigation to support the submandibular space and reduce recurrence or bulging.[48,65]

Botulinum toxin (Botox, Allergan Aesthetics, an AbbVie company, Irvine, CA) is increasingly utilized both as a preventive and

therapeutic adjunct in submandibular gland surgery. Prophylactic injection directly into the gland, administered either preoperatively or intraoperatively, has been shown to lower rates of postoperative sialocele and fistula formation by transiently suppressing salivary output through acetylcholine blockade at the neuroglandular junction.[66-69]

Intraoral studies report a reduction in salivary complications with preoperative botulinum toxin A, with onset of effect in several days and duration lasting weeks to months.[70] For treatment of established sialocele or fistula, percutaneous injection under ultrasound guidance has demonstrated safety and efficacy, typically requiring 250 units of rimabotulinumtoxinB or 20 to 40 units of botulinum toxin A per gland, with effects lasting 3 to 4 months and repeat injections occasionally needed.[68,69]

Surgical Techniques

Patients most likely to benefit from submandibular gland resection include those with prominent or ptotic glands refractory to subplatysmal contouring alone. Younger patients and those highly concerned with visible scarring, particularly women seeking minimally invasive rejuvenation, may be candidates for transoral or retroauricular approaches.[8,40] Conversely, patients with gland atrophy, minimal submandibular bulk, or a history of previous neck surgery may not benefit from gland resection and could be at higher risk of complications.[48]

The lateral facelift (preauricular) incision offers a cosmetically favorable alternative to the transcervical approach, concealing scars within the hairline or auricular region.[71] It has been shown to provide reliable access to the submandibular gland with complication rates comparable to standard techniques, and reduced scar visibility was significantly.[72] Endoscope- or robot-assisted variants are feasible, with reduced operative time and high patient satisfaction, making this technique best suited for benign disease and patients prioritizing cosmesis.[8,9,73,74]

Published series also consistently describe techniques that preserve the capsule or dissect immediately superficial to it but do not include capsule closure as part of the procedure. After partial excision, most authors emphasize secure hemostasis and layered soft-tissue repair, rather than repairing the thin capsular layer, to limit risks such as hematoma, sialocele, or nerve injury.[4,7,48,75,76] Mendelson and Tutino specifically note leaving the capsule intact when possible.[4] Taken together, the literature suggests that capsule repair is neither routine nor necessary in aesthetic submandibular gland surgery.

Contraindications to these emerging techniques must also be considered. Transoral and minimally invasive approaches are generally contraindicated in the setting of malignancy, oral cavity infection, poor mouth opening, or previous radiation.[1,4,7,41,42,48] Partial gland resection is relatively contraindicated in patients with preexisting xerostomia, because further reduction in salivary output may result in symptomatic dry mouth.[48] Similarly, bleeding disorders and distorted anatomy from previous surgery necessitate caution, particularly when employing scar-sparing approaches with limited exposure.[48]

The ideal technique remains one that balances gland volume reduction with functional preservation, minimizes visible scarring, and avoids injury to adjacent neurovascular structures. Advances in preoperative imaging, 3-dimensional contour planning, and the use of intraoperative navigation or nerve monitoring may further improve precision and reduce complication rates.[7]

Limitations

This study has several limitations. First, the heterogeneity of study designs, predominantly retrospective case series, limits the strength of evidence. Second, outcome reporting was inconsistent, with subjective assessments, quantitative measures, and some studies using validated surveys. Third, only English-language articles were included, which may have introduced publication bias. Moreover, surgical experience, which was either heterogeneous or not explicitly documented in these studies, can influence complication rates and should be an area of future research.[77] Finally, because this review relied on previously published data, it is subject to the inherent limitations of the original studies.

CONCLUSIONS

Submandibular gland resection is a safe and effective adjunct in aesthetic neck contouring for properly selected patients. Although traditional transcervical and necklift-integrated approaches remain the most widely utilized minimally invasive techniques, including transoral, endoscopic, and robotic-assisted approaches, offer promising alternatives for patients prioritizing cosmesis. Partial gland resection and the use of energy-based devices, such as LigaSure, represent important advances in balancing aesthetic outcome with functional preservation. The observed differences in complication rates among various submandibular gland resection approaches are primarily because of anatomical exposure, proximity to critical neurovascular structures, and technical complexity.

Future studies should prioritize prospective, comparative evaluation of these techniques using standardized outcome measures. A greater emphasis on objective contour analysis, patient-reported outcomes, and long-term follow-up will be helpful in improving the success and refinement of the technique of submandibular gland resection for aesthetic rejuvenation.

Supplemental Material

This article contains supplemental material located online at https://doi.org/10.1093/asj/sjaf206.

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In the preparation of this manuscript, the OpenAI (San Francisco, CA) language model, specifically ChatGPT-4.0, was employed to assist in coding assistance, language editing, spelling corrections, and refinement of phrasing. The usage of this AI tool was strictly limited to enhancing the linguistic clarity and readability of the content that was already conceptually and substantively developed by the human authors. At no point was the AI utilized to generate original ideas, conduct research, or author any part of the manuscript independently. The contributions of ChatGPT were thoroughly reviewed and, where appropriate, revised by the manuscript's authors to ensure they accurately reflected the intended meaning and maintained the originality of the research.

Disclosures

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