



## Root of Helix Inter Tragus Notch Incision (RHITNI) for open temporomandibular joint surgery: A five-year retrospective cohort study on safety and complications

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### ABSTRACT

Open temporomandibular joint (TMJ) surgery must balance exposure, facial nerve preservation, and cosmesis. The Root of Helix Inter Tragus Notch Incision (RHITNI), an endaural modification with promising aesthetics and low morbidity, lacks systematic outcome data. A single-center retrospective cohort study of consecutive primary open TMJ procedures using RHITNI over five years was performed. Primary endpoint: branch-specific facial nerve dysfunction (temporary or permanent). Secondary endpoints: auriculotemporal sensory change, salivary complications, hematoma, infection, wound problems, and scar concerns. Outcomes were stratified by procedure type and calculated per surgical site (joint). Thirty-seven patients underwent surgery, for a total of 46 operated joints. Follow-up was completed for all patients over a five-year period. Temporary complications occurred in 6/46 joints (13.0 %). Specific events included: transient facial nerve weakness in 2/46 (4.3 %); auriculotemporal hypoesthesia/paresthesia in 2/46 (4.3 %); ear canal blood clot in 1/46 (2.2 %); and preauricular edema in 1/46 (2.2 %). All transient events resolved (median facial nerve recovery 322 days, range 300–344). No infections, salivary issues, dehiscence, or scar-related complaints were recorded. No permanent complications (>12 months persistence) were observed (0 %). RHITNI provided safe access for open TMJ surgery, with 4.3 % transient facial nerve weakness, no permanent deficits, and minimal locoregional morbidity regardless of the intra-articular procedure performed. Findings compare favorably with benchmarks and support RHITNI as an aesthetic, nerve-sparing option.

### 1. Introduction

Open temporomandibular joint (TMJ) surgery must achieve adequate joint exposure while minimizing facial nerve injury and ensuring an acceptable cosmetic outcome (Ghawi et al., 2016; Sikora et al., 2021). Among facial nerve branches, the temporal and zygomatic divisions are particularly vulnerable (Liu et al., 2015). Over the past two decades, surgical focus has shifted from the choice of skin incision to the plane of fascial dissection, with deep subfascial approaches proposed to improve exposure and provide a protective layer over the facial nerve,

maintaining wide exposure of the zygomatic arch and TMJ (Al-Kayat and Bramley, 1979; Cascone et al., 2021). Politi et al. described a deep subfascial technique beneath both layers of the deep temporalis fascia and the temporal fat pad, reporting excellent exposure with no motor deficits (Politi et al., 2004).

Concurrently, refinements in endaural and preauricular incisions have aimed to improve scar aesthetic without compromising nerve preservation (Pauwels et al., 2022). Evidence from randomized trials suggests that the risk of transient facial nerve dysfunction depends more on the dissection plane and technique than on the location of the

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cutaneous incision. In a randomized comparison of a deep supra-temporalis subfascial approach versus a traditional plane, transient postoperative weakness was common but typically resolved within two to six months, with electrophysiologic differences at six months (Elsayed et al., 2022). Broader assessments confirm that most facial nerve deficits following open TMJ procedures represent transient neuropraxias, with recovery by six months in the majority of cases; permanent injuries are rare. Endaural techniques have demonstrated similarly low rates of permanent nerve dysfunction, despite variability in early weakness (Liu et al., 2015).

The Root of Helix Inter Tragus Notch Incision (RHITNI) has been proposed as an endaural variant that has a helix extension. This technique places a short incision between the root of the helix and the tragus notch, concealing the scar within the conchal-tragal complex (Ângelo, 2020). However, systematic data on outcomes and complications associated with RHITNI are lacking. The objective of this study was to comprehensively evaluate the safety profile of the RHITNI approach. The primary endpoint assessed the incidence of all postoperative surgical complications, including facial nerve dysfunction, sensory disturbances, vascular events, and wound issues, stratified by the specific intra-articular procedure performed. These findings are interpreted in the context of contemporary literature on nerve-sparing surgical planes and extraoral access approaches.

## 2. Materials and methods

### 2.1. Study design

The authors conducted a single-center, retrospective cohort study of consecutive open TMJ surgeries performed using the Root of Helix Inter Tragus Notch Incision (RHITNI) over a five-year period. Institutional review board approval was obtained, and a waiver of informed consent was granted given the exclusive use of de-identified data.

### 2.2. Patient selection

All patients who underwent open TMJ surgery via RHITNI between January 2020 and July 2024 were eligible. Both unilateral and bilateral

procedures were included. Cases of reoperation on the same joint were excluded to eliminate bias associated with previous scarring. Exclusion criteria were otherwise limited to patients with missing primary outcome data or unavailable operative records.

### 2.3. Data collection

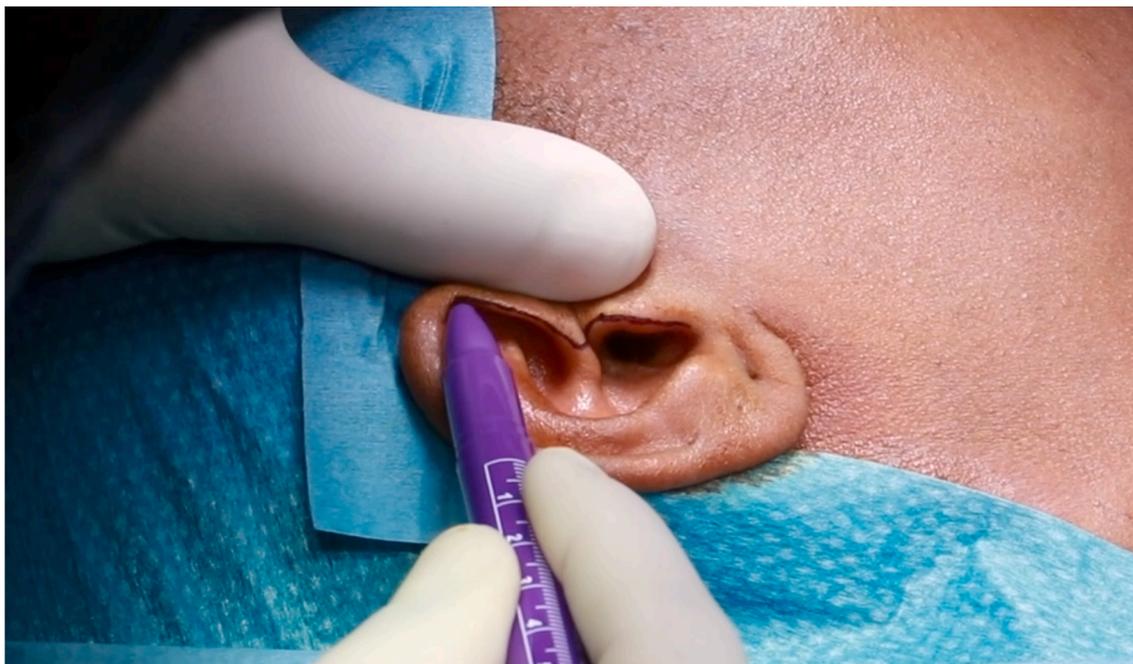
Data were abstracted from electronic health records, operative reports, anaesthesia charts, and outpatient clinic documentation. A maintained departmental spreadsheet, curated for research purposes, was used for data collation. Collected variables included age, sex, surgical laterality, primary diagnosis or indication, specific procedure performed, and operative time.

### 2.4. Surgical procedure

All surgical procedure were performed by the same surgeon (D.F.Â). RHITNI technique consists of a short, auricular-contoured incision between the root of the helix and the tragus notch (Fig. 1), performed without cartilage transection and with preservation of the perichondrium. Following subdermal undermining and haemostasis, dissection proceeded within a nerve-preserving fascial plane, till reaching the joint capsule (Fig. 2). The incision is adapted to the required exposure and any pre-existing scarring. In cases requiring broader exposure, a deep subfascial approach beneath the deep temporalis fascia and temporal fat pad was preferred. The joint capsule is entered (Fig. 3) and a layered closure is performed according to standard protocol (Fig. 4). All patients received standard postoperative care, including multimodal analgesia, early mobilization, and progressive dietary advancement per institutional guidelines. Follow-up assessments were routinely scheduled at 7–14 days and at 4–6 weeks, with additional visits documented as clinically indicated.

### 2.5. Outcomes

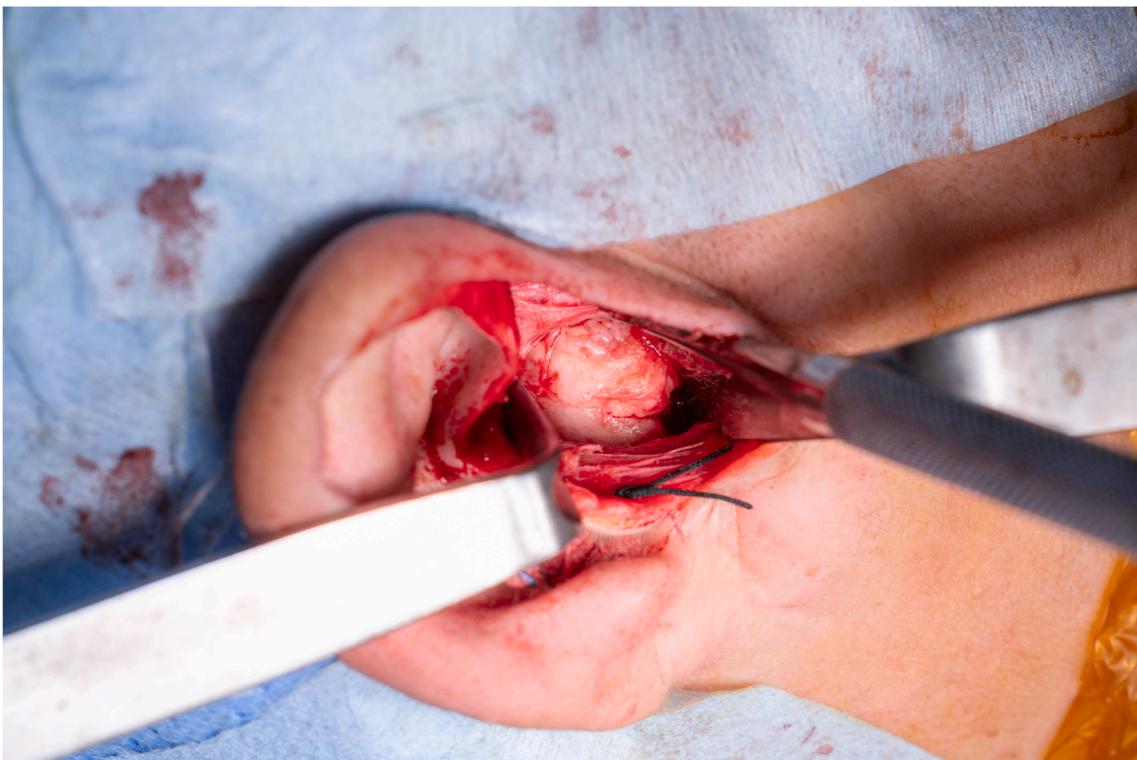
The study endpoints assessed all postoperative surgical complications, including facial nerve dysfunction, sensory disturbances, infection, hematoma, and wound issues. Complications were classified as



**Fig. 1. – RHITNI incision drawing:** preoperative landmarks and skin marking for the Root-of-the-Helix-Intertragal Notch Incision (RHITNI), delineating the endaural corridor while preserving auricular contours.



**Fig. 2.** – Surgical exposure offered by RHITNI: cutaneous incision along RHITNI and superficial dissection with strict perichondrial preservation (no cartilage transection) to optimize scar concealment; peri-temporomandibular joint surgical exposure afforded by the RHITNI incision.



**Fig. 3.** – Condylar exposure obtained through the RHITNI approach via a deep-subfascial corridor over the zygomatic root, providing direct access to the lateral TMJ capsule and condylar neck.

temporary (resolving during follow-up) or permanent. To account for slow nerve regeneration, permanent complications were defined as deficits persisting for >12 months or present at the final follow-up beyond that period. Aesthetic outcomes were evaluated clinically at each follow-up visit based on specific parameters: presence of hypertrophic scarring or keloids, scar pigmentation, and pliability. The

primary metric for aesthetic failure was defined as the patient's request for scar revision surgery or the clinical indication for corticosteroid infiltration due to maladaptive scarring. Outcomes and complication rates were calculated per single surgical site to account for bilateral procedures. Recovery time for temporary complications was defined as the interval between surgery and the follow-up visit where complete



**Fig. 4.** – Aesthetic closure obtained through RHITNI: layered closure with restoration of parotidomasseteric fascia; immediate postoperative aspect showing the scar camouflaged within the conchal–tragal complex.

resolution was clinically confirmed."

2.6. Statistical analysis

Data were analyzed using SPSS (v26) software. Analyses were primarily descriptive. Continuous variables are summarized as mean (standard deviation) or median, by interquartile range [IQR] and range; categorical variables as counts and percentages. Proportions are reported with exact (Clopper–Pearson) 95 % confidence intervals where appropriate. Comparisons of complication rates between different intra-articular procedure groups were performed using two-sided Fisher's exact tests. Missingness was handled by complete-case analysis per endpoint. A p-value <0.05 was considered statistically significant.

3. Results

Over a five-year period, a total of 37 patients met the inclusion criteria for primary open TMJ surgery via RHITNI (Table 1). The cohort was predominantly female (29/37, 78.4 %), with a median age of 49.0 years (IQR 32.0–63.0). Follow-up data were available for all patients, with a median follow-up duration of 584 days (IQR 363–861; range 157–1561).

Nine patients underwent bilateral procedures, resulting in a total of

**Table 1**  
Baseline characteristics.

Characteristic	Primary (n = 37)
Age, years (median [IQR])	49.0 (32.0–63.0)
Female, n (%)	29 (78.4 %)
Male, n (%)	8 (21.6 %)
Follow-up, days (median [IQR]) (n = 37)	584.0 (363.0–861.0)
Follow-up, days (min–max)	157–1561
Surgical Laterality, n%	Unilateral 28 (75.7 %) Bilateral 9 (24.3 %)
Total Joint Operated	46

46 operated joints. The procedures performed included Discopexy with Anchor (n = 16), Discectomy with Shaving (n = 9), Simple Discectomy (n = 8), Discectomy with Condylectomy (n = 7), Isolated Eminectomy (n = 4), and Discopexy with Shaving (n = 2).

Temporary complications were recorded in 6 of 46 joints (13.0 %). The distribution of procedures and associated complications is detailed in Table 2. Specifically:

- Transient facial nerve weakness: 2/46 joints (4.3 %; 95 % CI 0.5–14.8 %). Both cases occurred in the simple discectomy group but resolved fully. Recovery ranged from 300 to 344 days.
- Auriculotemporal hypoesthesia/paresthesia: 2/46 joints (4.3 %). Both occurred in the discopexy with anchor group. Recovery ranged from 26 to 60 days.
- Ear canal blood clot: 1/46 joints (2.2 %).
- Postoperative edema: 1/46 joints (2.2 %).

One clot recorded in the raw data was excluded from this analysis as it occurred on the contralateral side treated via arthroscopy. No permanent complications (>12 months persistence) were recorded (0 %), and there were no cases of surgical site infection, salivary fistula, or wound dehiscence. Statistical analysis using Fisher's exact test showed no significant difference in complication rates between the surgical subgroups (p > 0.99).

3.1. Time to complication recovery

The median time to resolution for all temporary postoperative complications was 42.5 days (Range: 24–344). When analyzed by specific event, recovery was fastest for the single case of edema (24 days) and the ear canal blood clot (36 days). Auriculotemporal hypoesthesia or paresthesia resolved within a range of 26–60 days (median 43 days). Transient facial nerve weakness showed the longest recovery period, ranging from 300 to 344 days (median 322 days) (Table 3). Crucially, all

**Table 2**  
Complications stratified by intra-articular procedure type (N = 46 joints).

Procedure Type	N (Joints)	Facial Nerve Weakness (Transient)	Auriculotemporal Paresthesia	Clot/Edema	Total Complications (%)
Discepey with Anchor	16	0	2	0	2 (12.5 %)
Discectomy + Shaving	9	0	0	0	0 (0.0 %)
Simple Discectomy	8	2	0	0	2 (25.0 %)
Discectomy + Condylectomy	7	0	0	1	1 (14.3 %)
Isolated Eminectomy	4	0	0	1	1 (25.0 %)
Discepey + Shaving	2	0	0	0	0 (0.0 %)
<b>Total</b>	<b>46</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>6 (13.0 %)</b>

**Table 3**  
**Time to recovery.** All temporary complications resolved completely within the follow-up period.

Complication	N (Events)	Time to recovery in days, Median (Range)
All Temporary Complications	6	42.5 (24–344)
Edema/Swelling	1	24 (n/a)
Ear canal blood clot	1	36 (n/a)
Auriculotemporal hypoesthesia	2	43.0 (26–60)
Facial nerve weakness (transient)	2	322.0 (300–344)

temporary complications resolved completely within the follow-up period, and no permanent deficits (>12 months persistence) were recorded."

#### 4. Discussion

These findings indicate that RHITNI achieves a complication profile below that of contemporary open TMJ approaches, while preserving operative versatility and offering scar concealment within the auricular complex (Angelo, 2020). The rate of transient facial nerve weakness observed in this cohort (4.3 %), with no permanent deficits, compares favorably with modern preauricular series, where early weakness is reported in 8–13 % of patients and typically resolves within three to six months (do Egito Vasconcelos et al., 2007; Gerber et al., 2025; Liu et al., 2015; Weinberg and Kryshalskyj, 1992). His pattern reinforces the prevailing consensus that nerve safety in open TMJ surgery is determined less by the skin incision and more by the fascial dissection plane and the mechanics of retraction (Al-Moraissi et al., 2018; Lu and Liu, 2022). The deep subfascial approach described by Politi et al., which interposes fascia and fat between retractors and the frontal branch, was associated with no motor loss in the original series (Politi et al., 2004). Randomized evidence has shown that transient weakness is common but resolves with careful retraction and fascial preservation (Elsayed et al., 2022). Endaural approaches have historically reported variable early dysfunction rates but consistently low rates of permanent injury, a pattern aligned with neuropraxia as the predominant mechanism of injury (Liu et al., 2015; Pauwels et al., 2022). The present results, showing no permanent facial nerve deficits, strengthen this anatomical rationale. In this context, our low neurosensory morbidity through an endaural modified incision is coherent with a strategy that privileges protected fascial corridors and controlled retraction.

To address the limitation of a retrospective design without a concurrent control group, these outcomes were benchmarked against large-scale meta-analyses of standard approaches. The observed 4.3 % incidence of transient nerve weakness falls within the lower range of morbidity reported for the classic preauricular approach, which ranges from 10 % to 32 % in systematic reviews (Al-Moraissi et al., 2018; Lu and Liu, 2022). This comparison suggests that the aesthetic modifications of the RHITNI do not come at the cost of increased neurosensory risk compared to established historical controls.

Given that the primary advantage of RHITNI is concealment, precise

aesthetic evaluation is critical. The aesthetic success was rigorously defined by the absence of maladaptive healing features. Clinical inspection confirmed no cases of keloid formation, hypertrophy, or hypopigmentation. Furthermore, the 0 % rate of scar revision surgery serves as a robust objective indicator of patient satisfaction, particularly when compared to preauricular approaches where scar visibility often drives secondary procedures.

Retroauricular and facelift-style incisions have been developed to maximize scar concealment while enabling joint surgery, eminectomy/eminoplasty, and selected ankylosis cases. Systematic reviews indicated that when SMAS and parotid planes are respected, morbidity is acceptable (Lu and Liu, 2022; Di Zhang et al., 2022). By contrast, retromandibular transparotid approaches, widely used for condylar and subcondylar trauma, traverse glandular tissue and place facial branches at measurable risk. Meta-analyses and single-center reports consistently describe non-trivial rates of transient palsy, with permanent deficits uncommon but not negligible (Al-Moraissi et al., 2018; Van Hevele and Nout, 2018; Koirala and Subedi, 2021; Lu and Liu, 2022; Parhiz et al., 2020). Although trauma cohorts differ in pathology from degenerative or internal derangement populations, they nevertheless provide a useful ceiling of risk for extraoral routes that cross the parotid. In contrast, RHITNI proceeds cranial to the parotid in a single-layer subfascial flap and involves minimal soft-tissue undermining, features that may explain the absence of salivary and wound complications in this series (Angelo, 2020).

Scar tissue and altered anatomical planes in reoperation cases are traditionally viewed as significant risk factors for facial nerve injury due to fibrosis and increased traction forces on the temporal branch (Peres Lima et al., 2023). Although reoperations were excluded from this analysis to strictly evaluate the primary safety profile of the incision, the theoretical advantage of the RHITNI approach—which utilizes a deep subfascial plane—may be particularly relevant in these complex scenarios. By proceeding beneath the temporal fascia and fat pad, the dissection avoids the superficial scarring and fibrosis typical of previous cutaneous approaches, potentially offering a safer corridor even in secondary surgeries. This consideration is particularly relevant for referral centers that inherit complex cases or perform conversion from arthroscopy to open procedures (Maffia et al., 2019). In parallel with extraoral refinements, intraoral and computer-assisted techniques have gained traction (Orabona et al., 2023). Guided proportional condylectomy with 3D-printed cutting guides, and endoscope-assisted piezoelectric condylectomy have demonstrated feasibility, accuracy and the advantage of avoiding cutaneous scars (Haas Junior et al., 2020; Sembronio et al., 2019). A comparative study highlights trade-offs: of preauricular versus intraoral execution underscores practical trade-offs: intraoral access reduces visible scars but requires specialized infrastructure and may limit lateral fossa access, particularly in multimodality open procedures (Sembronio et al., 2024). Extraoral routes remain versatile and time-efficient in complex or revision settings (Maffia et al., 2019). Within this landscape, RHITNI represents a cosmetically discreet compromise, preserving exposure and flexibility without materially increasing morbidity.

The patient-centered evidence further supports the pursuit of low-morbidity pathways. Studies consistently associate satisfaction with both symptom relief and perceived invasiveness (Rodrigues et al., 2023).

Tissue-sparing approaches such as slice functional condylectomy with piezoelectric techniques exemplify the same philosophy and are compatible with an access that minimizes collateral trauma while maintaining adequate visualization (Cascone et al., 2021).

The possible applicability of RHITNI to complex pathology also deserves consideration. In cases of synovial chondromatosis with cortical breach and endocranial extension, durable control depends on wider exposure and dural preservation. Reports adopting complete synovectomy with disc preservation have shown favourable remodelling and functional recovery without fossa reconstruction, reinforcing the role of nerve-respecting extraoral corridors in extensive disease (Maffia et al., 2019). Likewise, total alloplastic TMJ replacement is consistently associated with transient facial nerve weakness, probably due to the necessity of a larger approach and dissection. Large series and meta-analyses report recovery in the majority of patients, with single-digit rates of persistence (Gerber et al., 2025; Yoda et al., 2020). The absence of permanent nerve deficits in our RHITNI series thus places its outcomes well below the expected morbidity ceiling for open approaches requiring maximal exposure.

The principal strengths of this study include its consecutive multi-year cohort, the consistency of a single surgical team, and the use of explicit definitions distinguishing temporary from permanent complications. Limitations include the retrospective design, potential documentation variability, and the modest sample size, which limits statistical precision for rare outcomes. Furthermore, outcomes were reported at the patient-level rather than the joint level, which may obscure differences in bilateral procedures. Cross-study comparisons must be interpreted with caution, given heterogeneity in patient selection, surgical indications, definitions, and follow-up intervals.

## 5. Conclusion

RHITNI achieved low neurosensory morbidity of 4.3 % transient facial nerve weakness with no permanent deficits and negligible rates of non-neurologic complications. Within the context of contemporary literature on nerve-sparing planes and auricular-contoured access, these results support RHITNI as a cosmetically discreet, versatile, and safe extraoral route for open TMJ surgery. Although limited by sample size and hindsight design, our findings support broader but selective adoption and justify multicenter prospective validation using standardized branch-level nerve assessments and patient-reported outcomes.

## Conflict of interest

The authors declare no conflict of interest. The research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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