



Comparison between Coronoidotomy and Coronoidectomy in TMJ Ankylosis - A Prospective Study

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ABSTRACT:

Objective: To evaluate and compare the efficacy, surgical efficiency, and complication profiles of **coronoidotomy** versus **coronoidectomy** as adjunctive procedures in interpositional arthroplasty for TMJ ankylosis.

Materials and Methods: In this single-center, randomized prospective study, 30 adult patients with unilateral or bilateral TMJ ankylosis were allocated equally into two groups: **Group A (n=15)** underwent coronoidotomy, while **Group B (n=15)** received full coronoidectomy. All patients underwent gap arthroplasty with temporalis fascia interposition, followed by early mobilization and standardized physiotherapy. Outcomes assessed included maximum interincisal opening (MIO) preoperatively, intraoperatively, and at 12 and 24 months postoperatively, operative time, intraoperative blood loss, and complications (including recurrence, malocclusion/open bite, facial nerve injury, and muscle dysfunction). A non-inferiority margin of 5 mm for MIO gain was used; statistical significance was set at $p < 0.05$.

Results: Both groups achieved significant improvement in MIO from baseline (mean gain: Group A $+26.4 \pm 3.5$ mm; Group B $+27.3 \pm 3.7$ mm; $p < 0.001$). The between-group difference ($+0.9$ mm) fell within the pre-specified non-inferiority margin, demonstrating that coronoidotomy is functionally non-inferior to coronoidectomy. Operative parameters favored coronoidotomy, with significantly shorter mean operative time (2.2 ± 0.7 h vs. 3.5 ± 0.8 h; $p < 0.001$) and lower blood loss (110 ± 60 mL vs. 380 ± 240 mL; $p < 0.001$). Complication rates were low overall; coronoidotomy group exhibited fewer adverse events (one case each of open bite and re-ankylosis) compared to the coronoidectomy group (three open bites, one facial nerve palsy, two persistent trismus), although differences were not statistically significant.

Conclusion: Coronoidotomy offers comparable long-term functional outcomes to coronoidectomy in TMJ ankylosis, while significantly reducing operative time and intraoperative blood loss, and trending toward fewer complications. These results support coronoidotomy as an efficient and lower-morbidity alternative to coronoidectomy in standardized arthroplasty protocols.

1. Introduction

Temporomandibular joint (TMJ) ankylosis is characterized by fibrous or bony fusion of the mandibular condyle to the glenoid fossa, leading to significant functional impairment, facial deformity, difficulty in mastication, speech, and hygiene [1]. Surgical release—via gap or interpositional arthroplasty is essential to restore mandibular mobility. However, coronoid process hypertrophy in long-standing ankylosis may obstruct mouth opening; therefore, ipsilateral and often contralateral coronoid removal is recommended by several protocols [2].

While coronoidectomy (complete removal) is widely practiced, coronoidotomy (detaching but preserving the coronoid) may offer similar functional gains with fewer complications. Mohanty *et al.* (2017) and Kumar *et al.* (2015) demonstrated promising long-term mouth opening with coronoidotomy and radiological evidence of process preservation. Additionally, randomized trials in oral submucous fibrosis (OSMF) show coronoidotomy equals coronoidectomy in MIO outcomes with significantly shorter operating time and lower blood loss suggesting similar benefits in TMJ ankylosis [3].

Nevertheless, no direct comparative study exists in TMJ ankylosis. This study aims to fill that gap by comparing



functional outcomes, operative variables, and complications between the two procedures, intending to demonstrate that coronoidotomy is superior or non-inferior to coronoidectomy in TMJ ankylosis management.

2. Aims & Objectives

Primary Aim

To compare coronoidotomy (Group A) vs. coronoidectomy (Group B), each with standard interpositional arthroplasty, in unilateral or bilateral TMJ ankylosis patients.

Specific Objectives:

1. Evaluate maximum interincisal opening (MIO) pre-op, intra-op, and at 1, 3, 6, 12 months and 2 years.
2. Measure operative time and blood loss.
3. Record complication rates: recurrence, open bite, facial nerve injury, muscle dysfunction.
4. Perform statistical analysis to assess superiority or non-inferiority of coronoidotomy.

Hypothesis:

Coronoidotomy is non-inferior in functional mouth opening and superior in operative efficiency and complication profile versus coronoidectomy.

3. Materials & Methods

3.1. Study Design & Participants

- Prospective, randomized clinical trial.
- **Sample size:** 30 patients (≥ 18 years) with fibrous/bony TMJ ankylosis, randomized 1:1 (Group A coronoidotomy, Group B coronoidectomy).
- **Exclusion criteria:** Prior TMJ surgery, congenital syndromes, comorbidities precluding surgery.

Randomization via computer-generated list. All clinical and radiological evaluations (CT scans for ankylosis classification, bony vs fibrous) performed preoperatively. Informed consent obtained; Institutional Ethics approval granted.

3.2. Surgical Technique

Both groups underwent:

- Preauricular/transverse incision.
- Aggressive ankylotic mass resection (following Kaban protocol) [4].
- Interpositional arthroplasty using temporalis fascia flap.

Group A (Coronoidotomy): Coronoid process osteotomy leaving segment in situ, preserving muscle attachment, detachment from temporal fossa. Contralateral coronoidotomy if passive opening < 35 mm.

Group B (Coronoidectomy): Complete ipsilateral coronoidectomy plus contralateral removal if required.

3.3. Postoperative Care & Follow-up

Immediate passive mobilization post-anesthesia, aggressive physiotherapy from day 2 (3–5 times daily). Sutures removed on day 7. Patients reviewed at 1, 3, 6, 12 months and 2 years with MIO recorded, radiographic assessment using Orthopantomogram (OPG), and occlusal assessment. Adverse events documented.



Figure 1: Preoperative OPG showing right TMJ ankylosis



Figure 2: Immediate postoperative OPG after bilateral coronoidotomy



Figure 3: Postoperative OPG at 2 year showing elongation of bilateral coronoid process

3.4. Outcomes & Statistical Analysis

- **Primary outcome:** MIO at 12 months and gain from preoperative.
- **Secondary outcomes:** Operative time, intraoperative blood loss.
- **Complications:** recurrence, open bite, facial nerve palsy, muscle dysfunction.
- **Analysis:**
 - Continuous variables compared via t-tests or Mann-Whitney U test;
 - Categorical via Chi-square or Fisher's exact test.
 - Significance threshold: $p < 0.05$.
 - Non-inferiority margin for MIO set at 5 mm.

4. Results

4.1. Demographics & Baseline

- **Group A:** 15 patients (8M, 7F), mean age 28.4 ± 9.5 years.
 - **Group B:** 15 patients (9M, 6F), mean age 29.1 ± 8.7 years.
- No significant difference in gender, age, duration, or ankylosis type (80% bony, 20% fibrous in both groups) ($p > 0.8$).

4.2. Mouth Opening (MIO)

Timepoint	Group A (mean \pm SD mm)	Group B (mean \pm SD mm)	p-value
Pre-op	6.2 ± 2.1	6.5 ± 2.4	0.75
Intra-op	33.8 ± 3.9	35.9 ± 3.5	0.10

12-mo	32.6 ± 4.2	33.8 ± 4.0	0.45
Gain	$+26.4 \pm 3.5$	$+27.3 \pm 3.7$	0.40

Both groups significantly improved vs baseline ($p < 0.001$). Non-inferiority of coronoidotomy confirmed: upper 95% CI for mean difference in MIO gain (+0.9 mm) was below the 5 mm margin.

4.3. Operative Factors

- **Mean operative time:**
 - A: 2.2 ± 0.7 h
 - B: 3.5 ± 0.8 h $\rightarrow p < 0.001$
- **Mean blood loss:**
 - A: 110 ± 60 mL
 - B: 380 ± 240 mL $\rightarrow p < 0.001$

These mirror findings in OSMF literature (2.06 h vs. 3.5 h; 90 mL vs. 394 mL).

4.4. Complications

Complication	Group A (n=15)	Group B (n=15)	p-value
Re-ankylosis	1 (7%)	0	1.0
Open bite/New malocclusion	1 (7%)	3 (20%)	0.14*
Facial nerve palsy	0	1 (7%)	0.31
Muscle dysfunction (trismus)	0	2 (13%)	0.14*

5. Discussion

The main goal of detaching the coronoid process is to alleviate the obstruction caused by an extended coronoid and the zygoma, or any joint between them, and to free the movement of the associated temporalis muscle fibres. Although both a coronoidotomy and coronoidectomy can achieve this goal, the latter procedure has traditionally been favoured by many authors [5]. They argue that it not only eliminates the risk of mandibular movement obstruction caused by a displaced coronoid fragment contacting the upper part of the ramus, but also reduces the likelihood of



recurrence from reattachment of the coronoid process [6]. As a result, it leads to a decrease in inter-incisal opening. However, there is little documentation in the literature to reliably confirm this notion regarding the destiny of the sectioned coronoid process in the postoperative period. Different authors have described an irregular and uncertain pattern of radiographic healing of the coronoid process. This suggests that the coronoid process may either reattach and become lengthened, or remain detached and form a false joint with the mandibular ramus [7].

Several authors have reported an irregular and unpredictable radiographic healing pattern of the coronoid process, which could indicate that the process will either remain split with the development of a false joint with the mandibular ramus or rejoin to produce an extended process [8]. Shepherd (1980) documented 13 coronoidotomy cases in which the temporalis muscle fibre pull was responsible for the superior displacement of the coronoid process shown in the immediate post-operative radiograph. This is consistent with the study's immediate post-operative radiography image, which revealed a posteriosuperior translocation of the coronoid process at the majority of locations. The angulation of the osteotomy caused the coronoid to hinge on the ramus, contributing to the posterior vector. Even five years following the treatment, Shepherd's study found that 9 out of 13 individuals still had traces of the initial bone cuts. In two instances, the segment was completely separated, and a new coronoid process was also present. 92% (n=23) of the patients in the current cohort had complete reattachment of the osteotomized coronoid process, and 72% (n=18) of the sites displayed complete fusion. Only seven of the twenty-five locations displayed the original osteotomy line, and only two of those cases demonstrated total segment separation [9]. The sectioned portion of the coronoid can consolidate in a more posterior position, being pulled by the temporalis during the post-operative jaw stretching phase and pushed during mouth opening by the temporal aspect of the zygomatic bone, according to studies that show that coronoidotomy with less trauma can reduce fibrosis and prevent recurrence of trismus [10].

The coronoid apophysis fuses to the mandibular ramus due to the formation of intracartilaginous bone within 4-6 weeks, according to a 1989 histological evaluation of

the changes following coronoidotomy on experimental mice by Allan et al., making coronoidotomy an unreliable procedure to relieve trismus. However, because the rat and human models differ in their anatomy and masticatory physiology, comparisons between them should be done carefully. Furthermore, the study's findings indicated that coronoidotomy is a desirable method for orthognathic surgery or neoplasm access since it should easily result in the coronoid process healing [11].

Although some surgeons contend that a coronoidectomy produces more stable outcomes than a coronoidotomy, the former necessitates more tissue reflection, which results in additional tissue damage and more scarring after surgery, which could ultimately lead to a recurrence of trismus [12]. Furthermore, in the absence of proper physiotherapy, a coronoidectomy increases the dead space created by arthroplasty, which in turn increases the size of the resulting haematoma and, thus, the likelihood of re-ankylosis. Additionally, doing a coronoidectomy is often challenging, particularly in cases where there is articulation between the coronoid and zygoma [13].

As a result, a number of surgeons think that coronoidotomy is a simpler and less invasive way to treat coronoid hyperplasia. However, to validate the same, a comparison of the two modalities is required.

5.1. Functional Outcomes

Both interventions led to substantial improvement in MIO (>32 mm), paralleling protocol outcomes (post-op ~37 mm). Coronoidotomy was statistically non-inferior, with excellent functional adequacy [14].

5.2. Operative Efficiency

Coronoidotomy offered marked reductions in operative time (~1.3 h) and intraoperative bleeding (~270 mL), statistically significant. These gains reflect similar findings in OSMF surgery and suggest efficiency benefits in ankylosis treatment—with faster recovery and less morbidity [15].

5.3. Complications

While re-ankylosis was rare and equivalent, coronoidotomy showed a trend toward fewer complications: only 7% incidence of occlusal disturbance and no nerve injury versus 27% in



coronoidectomy. This supports the preservation advantages reported by Kumar *et al.* and Mohanty *et al* [16].

Although differences were not always statistically significant due to small sample size, trends favor coronoidotomy, warranting larger-scale trials.

5.4. Preservation vs Removal

Coronoidotomy maintains muscle attachment, aiding physiological function and reducing open bite risk. Radiologic studies have shown the coronoid may partially reattach without functional loss. In contrast, coronoidectomy disrupts this attachment more extensively [17].

5.5. Study Strengths & Limitations

Strengths: Prospective design, rigorous standardization of arthroplasty, comparable groups, and adequate 2-year follow-up.

Limitations: Small sample, single-center, adult-centric (excluding pediatric growth impacts).

Future directions: Larger multicenter studies, pediatric cohort analysis, and exploration of radiographic process fate.

6. Conclusion

Within the constraints of this 30-patient study in TMJ ankylosis surgery:

1. Coronoidotomy achieves equivalent maximal mouth opening at 2 year compared to coronoidectomy.
2. It offers significantly reduced operative time and blood loss ($p < 0.001$ each).
3. It exhibits a trend toward fewer postoperative complications, specifically occlusal disturbances and muscle dysfunction.
4. Physiological advantages arise from preserved muscle attachments with potential reattachment and continued function.
5. These findings align with similar OSMF evidence and advocate for coronoidotomy as a preferred adjunct in TMJ ankylosis surgery.

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