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Original Article

Temporomandibular Joint Ankylosis in Children: Surgical Approaches and Outcomes in 16 Cases

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Abstract

Background: Temporomandibular joint (TMJ) ankylosis in children causes restricted mouth opening, facial deformity, and functional impairment. This study aimed to evaluate the surgical approaches and treatment outcomes of pediatric TMJ ankylosis managed at a tertiary care center.

Methods: This retrospective study was conducted at the Department of Oral and Maxillofacial Surgery, Bangladesh Medical University and Bangladesh Multicare Hospital from January to December 2024. Sixteen pediatric patients (1–18 years) with TMJ ankylosis underwent surgical management. Procedures included interpositional arthroplasty, gap arthroplasty with or without coronoidectomy, and costochondral graft reconstruction. Outcomes were assessed using maximal interincisal opening (MIO).

Results: The mean age of the patients was 9.3 ± 3.2 years, with male predominance (62.5%). Trauma was the most common etiology (62.5%), followed by infection (18.8%). Unilateral ankylosis was present in 68.8% of cases. Interpositional arthroplasty was the most commonly performed procedure (37.5%). Mean preoperative MIO improved significantly from 5.9 ± 3.4 mm to 27.1 ± 7.2 mm at final follow-up ($p < 0.001$), with an overall mean improvement of 21.2 ± 6.3 mm. Bilateral cases showed comparatively lower postoperative mouth opening than unilateral cases. Reankylosis occurred in 12.5% of patients. Other complications included isolated cases of bleeding, wound infection, and temporary facial nerve weakness.

Conclusion: Surgical management of pediatric TMJ ankylosis provides significant functional improvement with acceptable complication rates. Early intervention, individualized surgical planning, and rigorous postoperative physiotherapy are essential for optimal outcomes and prevention of reankylosis.

Keywords: Temporomandibular joint ankylosis; Pediatric TMJ ankylosis; Surgical Approache; Mouth opening; Maxillofacial surgery

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Introduction

Temporomandibular joint (TMJ) ankylosis refers to the fibrous or osseous union between the mandibular condyle and the temporal bone. It can be either congenital or developed from trauma, infections, inflammatory conditions, radiation, surgical procedures, or tumors. Post-traumatic ankylosis of the temporomandibular joint often occurs due to late diagnosis, inadequate treatment, extended immobilization or insufficient physiotherapy [1,2].

TMJ ankylosis in children is an uncommon and

intricate condition that poses treatment difficulties arising from surgical challenges and the influence of facial development on results [3]. In children, TMJ ankylosis manifests through increasing trismus, asymmetry of the face, restricted mandibular development (retrognathia/micrognathia), difficulties in chewing and speaking, inadequate oral hygiene, and occasionally a bird-face deformity, typically after trauma or infection [4,5]. Childhood TMJ ankylosis can lead to facial deformities, psychological issues, and difficulty in mouth opening. It typically stems from fractures of the condyle, infrequently from infections of the middle ear [6].

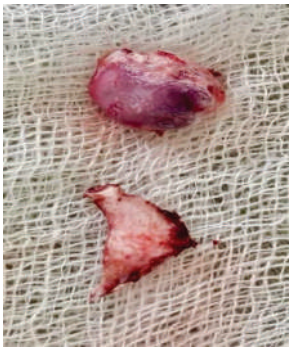
TMJ ankylosis is identified through clinical assessment and verified via imaging techniques (X-ray, orthopantomogram, CT, MRI, or 3D reconstruction). Sawhney and He and others suggested classification systems [7,8]. Various approaches have been suggested for the surgical treatment of TMJ ankylosis, including gap arthroplasty, interpositional arthroplasty, and joint reconstruction utilizing distraction osteogenesis, autologous grafts, free flaps, or alloplastic materials. The timing and order of treatment continue to be debated, particularly in pediatric patients [9,10].

Global studies found that every surgical method for TMJ ankylosis greatly enhanced mouth opening; nonetheless, reconstruction and interpositional arthroplasty produced superior functional results and reduced recurrence rates in comparison to gap arthroplasty by itself [11,12].

Research conducted in Bangladesh by Rahman and Haider (2021) and Rahman et al. (2022) indicated that trauma is the primary reason for TMJ ankylosis, with the majority of patients classified as Type III exhibiting facial deformities. Both studies highlighted that surgical intervention—especially interpositional arthroplasty—is the conclusive treatment, and intensive postoperative physiotherapy is crucial to avert re-ankylosis and enhance functional outcomes and quality of life [13,14].

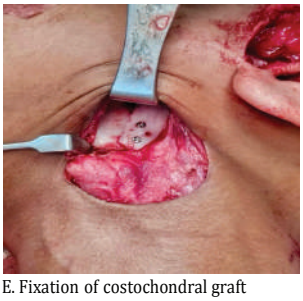
In Bangladesh, data on pediatric TMJ ankylosis is scarce and primarily descriptive, with trauma identified as the main cause and interpositional arthroplasty frequently performed. Nonetheless, comprehensive assessment of various surgical methods and results in children is insufficient. Consequently, this research seeks to evaluate surgical methods and functional results in 16 pediatric cases of TMJ ankylosis.


A. Exposing the ankylotic mass


B. Removing the ankylotic mass


C. Gap after removing the ankylotic mass


D. Costochondral Graft harvested


E. Fixation of costochondral graft


F. Final outcome

MATERIALS AND METHODS

Study Design and Setting

This retrospective observational study was conducted at the Department of Oral & Maxillofacial Surgery, Bangladesh Medical University and Bangladesh Multicare Hospitalover a period of one year from January 2024 to December 2024.

Study Population

Pediatric patients diagnosed with temporomandibular joint (TMJ) ankylosis who underwent surgical management at the study center during the study period were included in the study.

Inclusion and Exclusion Criteria

Patients aged 1–18 years with clinically and radiologically confirmed TMJ ankylosis who underwent surgical treatment and had available operative and follow-up records were included. Patients with incomplete medical records, inadequate follow-up information, or those

managed conservatively without surgery were excluded from the study.

Data Collection Procedure

Data were collected retrospectively from hospital medical records, operative notes, anesthesia charts, discharge summaries, and outpatient follow-up records using a structured data collection form. Demographic information, etiology of ankylosis, clinical presentation, airway management technique, surgical procedures, intraoperative findings, and postoperative complications were recorded.

Preoperative maximal interincisal opening (MIO) was measured clinically before surgery using a ruler or caliper as the distance between the upper and lower central incisors during maximal mouth opening. Intraoperative MIO was recorded immediately after surgical release of ankylosis. Follow-up data regarding postoperative mouth opening, recurrence, complications, and functional outcomes were obtained from scheduled postoperative follow-up visits documented in outpatient records. Patients were routinely followed at 1 month, 3 months, 6 months, and subsequently at regular intervals depending on clinical condition and compliance with physiotherapy. Final follow-up MIO measurements recorded during the last available follow-up visit were included for analysis.

Surgical Management

The surgical procedures performed included interpositional arthroplasty, gap arthroplasty, gap arthroplasty with coronoidectomy, and reconstruction with costochondral graft. The choice of surgical technique depended on the extent and type of ankylosis, intraoperative findings, and surgeon preference. Coronoidectomy was additionally performed in selected cases where adequate mouth opening could not be achieved after release of ankylosis.

Statistical Analysis

Data were analyzed using Statistical Package for Social Sciences (SPSS) version 26.0. Continuous variables were expressed as mean ± standard deviation (SD), while categorical variables were presented as frequency and percentage. Paired t-test was used to compare preoperative and postoperative maximal interincisal opening (MIO). A p-value of less than 0.05 was considered statistically significant.

Ethical Consideration

Ethical approval was obtained from the Institutional Review Board of Bangladesh Medical University. Confidentiality and anonymity of patient information were maintained throughout the study.

RESULTS

Table 1 shows total of 16 pediatric patients with temporomandibular joint (TMJ) ankylosis were included in the study and underwent surgical management. The age of the patients ranged from 1 to 18 years, with a mean age of 9.3 ± 3.2 years. Male predominance was observed, with 10 (62.5%) male and 6 (37.5%) female patients. Most patients belonged to the 6–10 years age group (43.8%), followed by the 11–15 years age group (37.5%).

Table 1: Demographic Characteristics of the Study Participants (N = 16)

Variables	Category	Frequency (n)	Percentage (%)
Age group (years)	1–5	3	18.8
	6–10	7	43.8
	11–18	6	37.5
Sex	Male	10	62.5
	Female	6	37.5
Mean age (years)	Mean ± SD	9.3 ± 3.2	—

Table 2 presents trauma was identified as the most common etiology of TMJ ankylosis, accounting for 10 (62.5%) cases. Other causes included infection in 3 (18.8%) patients, congenital factors in 2 (12.5%) patients, and tumor in 1 (6.2%) patient. Unilateral ankylosis was more common than bilateral disease and was observed in 11 (68.8%) patients, whereas bilateral ankylosis was present in 5 (31.2%) patients. Among unilateral cases, the right side was affected in 6 (54.5%) patients and the left side in 5 (45.5%) patients.

Table 2: Etiology and Type of TMJ Ankylosis among the Study Participants (N = 16)

Variables	Category	Frequency (n)	Percentage (%)
Etiology	Trauma	10	62.5
	Infection	3	18.8
	Congenital	2	12.5
	Tumor	1	6.2
Type of ankylosis	Unilateral	11	68.8
	Bilateral	5	31.2
Side involved (Unilateral cases, n = 11)	Right	6	54.5
	Left	5	45.5

Table 3 shows restricted mouth opening was the presenting complaint in all patients. Difficulty in mastication was observed in 13 (81.3%) patients, followed by facial asymmetry in 11 (68.8%) patients and poor oral hygiene in 9 (56.3%) patients. Speech difficulty and obstructive sleep symptoms were noted in 6 (37.5%) and 3 (18.8%) patients, respectively. Fourteen (87.5%) patients had a competent airway, whereas 2 (12.5%) patients were

tracheostomy-dependent due to severe bilateral ankylosis and marked restriction of mouth opening.

Table 3: Clinical Presentation and Airway Status of the Study Participants (N = 16)

Clinical Features	Frequency (n)	Percentage (%)
Restricted mouth opening	16	100
Difficulty in mastication	13	81.3
Facial asymmetry	11	68.8
Poor oral hygiene	9	56.3
Speech difficulty	6	37.5
Obstructive sleep symptoms	3	18.8
Competent airway	14	87.5
Tracheostomy-dependent airway	2	12.5

Table 4 shows fibre optic intubation was the most frequently used technique and was performed in 8 (50.0%) patients. Blind nasal intubation was used in 4 (25.0%) patients, while tracheostomy-assisted intubation and direct laryngoscopy were performed in 3 (18.7%) and 1 (6.3%)patient, respectively. One patient with a competent airway underwent elective tracheostomy because of anticipated difficult airway management.

Table 4: Technique of Intubation Used During Surgery (N = 16)

Technique of Intubation	Frequency (n)	Percentage (%)	Cumulative %
Direct laryngoscopy	1	6.3	6.3
Blind nasal	4	25.0	31.3
Fibre optic	8	50.0	81.3
Via tracheostomy	3	18.7	100

Table 5 shows with regard to surgical management, interpositional arthroplasty was the most commonly performed procedure and was carried out in 6 (37.5%) patients. Gap arthroplasty was performed in 5 (31.3%) patients, while gap arthroplasty with coronoidectomy was done in 3 (18.7%) patients. Reconstruction with costochondral graft was performed in 2 (12.5%) patients. Coronoidectomy was additionally performed in selected cases where satisfactory intraoperative mouth opening could not be achieved after release of ankylosis.

Table 5: Surgical Approaches Used for TMJ Ankylosis Management (N = 16)

Surgical Procedures	Frequency (n)	Percentage (%)
Interpositional arthroplasty	6	37.5
Gap arthroplasty	5	31.3
Gap arthroplasty with coronoidectomy	3	18.7
Costochondral graft reconstruction	2	12.5

Table 6 presents preoperative maximal interincisal opening (MIO) ranged from 0 to 18 mm, with a mean ± SD of 5.9 ± 3.4 mm. Intraoperative MIO ranged from 20 to 42 mm, with a mean ± SD of 31.8 ± 5.7 mm. At final follow-up, MIO ranged from 8 to 38 mm, with a mean ± SD of 27.1 ± 7.2 mm. The overall improvement in mouth opening ranged from 8 to 32 mm, with a mean improvement of 21.2 ± 6.3 mm. The improvement between preoperative and final follow-up MIO was statistically significant ($p < 0.001$).

Table 6: Mouth Opening Outcomes of the Study Participants (N = 16)

Variable	Minimum	Maximum	Mean ± SD
Preoperative MIO	0 mm	18 mm	5.9 ± 3.4 mm
Intraoperative MIO	20 mm	42 mm	31.8 ± 5.7 mm
Final follow-up MIO	8 mm	38 mm	27.1 ± 7.2 mm
Overall improvement in MIO	8 mm	32 mm	21.2 ± 6.3 mm

Table 7 and table 8 shows ten patients demonstrated some reduction in mouth opening during follow-up compared with intraoperative measurements, whereas four patients showed improvement in mouth opening during follow-up. In two patients, the intraoperative mouth opening was maintained throughout the follow-up period.

Among unilateral ankylosis cases, the mean preoperative MIO was 6.8 ± 3.6 mm, which improved to a mean final MIO of 28.5 ± 6.9 mm. In bilateral cases, the mean preoperative MIO was comparatively lower at 3.8 ± 2.4 mm, with a mean final MIO of 24.0 ± 6.8 mm at final follow-up.

Table 7: Outcomes of Unilateral TMJ Ankylosis Cases (N = 11)

Variable	Minimum	Maximum	Mean ± SD
Preoperative MIO	0 mm	18 mm	6.8 ± 3.6 mm
Intraoperative MIO	22 mm	42 mm	32.9 ± 5.3 mm
Final follow-up MIO	10 mm	38 mm	28.5 ± 6.9 mm
Overall improvement in MIO	10 mm	32 mm	21.7 ± 5.9 mm

Table 8: Outcomes of Bilateral TMJ Ankylosis Cases (N= 5)

Variable	Minimum	Maximum	Mean ± SD
Preoperative MIO	0 mm	10 mm	3.8 ± 2.4 mm
Intraoperative MIO	20 mm	36 mm	29.4 ± 4.8 mm
Final follow-up MIO	8 mm	34 mm	24.0 ± 6.8 mm
Overall improvement in MIO	8 mm	28 mm	20.2 ± 6.1 mm

Table 9 presents reankylosis occurred in 2 (12.5%) patients during the follow-up period. Profuse intraoperative bleeding, postoperative wound infection, and temporary facial nerve weakness were encountered in 1 (6.3%) patient each. The facial nerve weakness resolved spontaneously during follow-up. The duration of follow-up ranged from 6 to 48 months, with a mean follow-up period of 18 ± 9.6 months.

Table 9: Postoperative Complications among the Study Participants (N = 16)

Variables	Frequency (n)	Percentage (%)
Reankylosis	2	12.5
Profuse intraoperative bleeding	1	6.3
Postoperative wound infection	1	6.3
Temporary facial nerve weakness	1	6.3

DISCUSSION

This series of 16 pediatric TMJ ankylosis cases demonstrates functional outcomes consistent with contemporary literature while highlighting important clinical considerations. The demographic profile, with mean age 9.3 years and male predominance (62.5%), aligns with previous reports[5,15]. Trauma as the predominant etiology (62.5%) corroborates findings from larger series, with Erol et al. reporting similar traumatic predominance in 85% of cases [16].

The mean mouth opening improvement of 21.2 ± 6.3 mm compares favorably with published outcomes. Zhi et al. reported improvement from 7.51 mm to 27.74 mm postoperatively [17], while Fariña et al. achieved improvement from 3 mm to 36 mm [18]. The finding that bilateral cases had poorer outcomes (final MIO 24.0 mm vs 28.5 mm for unilateral) reflects the greater complexity associated with bilateral ankylosis, as noted by Posnick and Goldstein[19].

The 12.5% reankylosis rate falls within the expected range for pediatric populations. While Rozanski et al.'s systematic review found only 2.27% reankylosis [5], Ramly et al. reported 75% recurrence in syndromic children[15], suggesting patient complexity influences outcomes. The relatively short follow-up (18 months) may underestimate long-term recurrence rates.

The complication profile in this study, including single instances of bleeding, infection, and temporary facial nerve weakness (6.3% each), compares favorably with literature reports. Zhi et al. reported no facial nerve paralysis in their 42-patient series[17], while Posnick and Goldstein noted minimal perioperative complications with no evidence of infection, facial nerve injuries, or bleeding in 9 pediatric patients [19]. The temporary nature of facial nerve weakness in our series, which resolved spontaneously, is consistent with expected outcomes when proper surgical technique is employed [20,21].

The surgical approach distribution, with interpositional arthroplasty most common (37.5%), reflects current practice trends. Rozanski et al. found no significant outcome differences between gap and interpositional arthroplasty [5], supporting technique selection based on individual case factors. The selective use of coronoidectomy aligns with established protocols emphasizing adequate intraoperative opening [22].

The low complication rate demonstrates surgical safety, while the 18.7% tracheostomy dependence underscores potential severity. These findings support current paradigms emphasizing early intervention, appropriate technique selection, and aggressive postoperative physiotherapy. The results reinforce the need for long-term follow-up given reankylosis risk and continued growth-related changes in pediatric patients.

CONCLUSION

Temporomandibular joint ankylosis in children causes significant functional and facial deformity-related morbidity. This study demonstrated that surgical management using interpositional arthroplasty, gap arthroplasty, and reconstructive procedures resulted in substantial improvement in mouth opening with acceptable complication and recurrence rates. Trauma was identified as the most common etiology, and bilateral

ankylosis cases showed comparatively poorer functional outcomes than unilateral cases. Early diagnosis, appropriate surgical technique selection, adequate airway management, and strict postoperative physiotherapy are essential for achieving favorable long-term outcomes. Long-term follow-up remains important because of the risk of reankylosis and ongoing craniofacial growth in pediatric patients.

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