



Quality of life after distraction osteogenesis in TMJ ankylosis patients

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Objective. The aim of our study was to evaluate the success of distraction osteogenesis in temporomandibular joint (TMJ) ankylosis patients with facial deformities at our maxillofacial unit; assess the psychosocial and well-being outcomes of distraction osteogenesis and its impact on oral health; and discriminate the differences in quality of life (QoL) with application of external or internal devices, unilateral or bilateral, linear or multivector, and maxillomandibular or mandibular distraction.

Study Design. QoL and the Oral Health Impact Profile (OHIP) were prospectively studied in 42 consecutive patients with facial deformities, planned for maxillofacial distraction osteogenesis, using 2 validated questionnaires, the Orthognathic Quality of Life Questionnaire and OHIP-14. Patients who had undergone any previous surgeries were excluded.

Results. Among these patients, 16 were female, 26 male; mean age was 14.98 ± 4.88 years, and all had prearthroplastic distraction. The shortening in the mandible was in the proportion 29:01:12 in the body, ramus, and ramus-body, respectively. Mean QoL scores before and after distraction were 68.52 ± 9.50 and 26.62 ± 3.51 ; and mean OHIP scores before and after distraction were 33.88 ± 6.26 and 15.36 ± 2.54 , a highly significant difference ($P < .001$) suggesting improvement. Significant improvement was identified on all QoL and OHIP questions after distraction ($P < .01$). The postdistraction overall mean QoL score among patients with extraoral or intraoral distractor did not have a significant difference ($P = .32$), but facial appearance in the bilateral distraction group; jaw function and overall well-being in the multivector distraction group; and facial appearance, jaw function, and overall well-being in maxillomandibular distraction group had significant improvements ($P < .05$).

Conclusions. Distraction osteogenesis considerably improves oral health and health-related QoL in patients with TMJ ankylosis with facial deformities. The use of an external or internal distractor did not make any difference in the QoL; however, bilateral distraction, multivector distraction, and maxillomandibular distraction resulted in better QoL outcomes. (Oral Surg Oral Med Oral Pathol Oral Radiol 2021;131:295–303)

Distraction osteogenesis (DO) involves formation of new tissue by gradual lengthening of bone and associated soft tissues with the activation of a distraction device, applied externally or internally.¹ It is commonly being used for correction of hypoplastic mandible or midface, temporomandibular joint (TMJ) ankylosis, hemifacial microsomia, and deficient residual alveolar bone height before implant placement and has had good results in terms of facial appearance, breathing, and function, with long-term stability.^{2,3}

The aim of our study was to evaluate the success of distraction, assess the psychosocial and well-being outcomes of DO and oral health in TMJ ankylosis patients with facial deformities at our maxillofacial unit; and to discriminate differences in quality of life (QoL) with application of external or internal distraction devices, unilateral or bilateral distraction, linear or multivector

distraction, and maxillomandibular or mandibular distraction.

MATERIAL AND METHODS

All TMJ ankylosis patients with facial deformities who visited our outpatient clinic from January 2016 to September 2017 who were planned for prearthroplastic maxillofacial distraction were prospectively studied to assess the impact of distraction on their quality of life and oral health profile. Patients who had undergone any previous surgeries were excluded. Institutional ethical clearance was obtained before the start of the study. A total of 54 patients were enrolled in this study after their informed consent, but 22% were lost to follow-up and only 42 patients could complete their 2 years of follow-up from the date of distractor placement and were statistically analyzed.

Distractor was activated after a 5-day postplacement latency period and performed at a rate of 1

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Statement of Clinical Relevance

Temporomandibular joint ankylosis is a debilitating condition that causes restricted mouth opening and difficulty in breathing, mastication, and speech. Distraction osteogenesis helps in correcting the deformity. This study illustrates how much improvement distraction osteogenesis brings in these patients.

millimeter (mm) per day for the required amount of distraction as needed. The consolidation phase lasted 2-4 months after distraction, and the distractors were not removed until callus ossification was evident radiographically.

The success of distraction was analyzed by 1 resident doctor on a scale of 1-4, on the basis of 5 major factors—namely appearance, jaw function, snoring, breathing and speech—where 1 represented the best and 4 the worst. This scoring was performed preoperatively and at 2-year follow-up to assess any change. The results were considered successful if improvement was significant statistically.

Quality of life (QoL) and oral health were assessed using 2 validated questionnaires. The Oral Health Impact Profile (OHIP), developed in 1994 by Slade and Spencer as a generic oral health tool,¹ initially included 49 questions (OHIP-49). A short form with 14 questions, 2 from each dimension (OHIP-14), developed by Slade² to simplify assessment, was used in our study to study oral health. The 14 OHIP questions covered daily aspects in emotion, physical health, learning, and vitality.

The Orthognathic Quality of Life Questionnaire (OQoLQ), developed by Cunningham³ in 2000 as a condition-specific tool, with proven validity and reliability, included 22 questions on 4 domains: social, facial aesthetics, oral function, and awareness of any facial deformity. Both the questionnaires were translated in the local language (Hindi) and validated before their implementation in the study by the same resident doctor.

Patients or their caregivers were interviewed preoperatively and 2-year follow-up with these questions. For each question in OQoLQ, a response was recorded on a rating scale of 1-4, where 1 represented “it bothers you a little” and 4 represented “it bothers you a lot”; 2 and 3 represented answers between statements 1 and 4, and NA represented “the statement does not apply to you or does not bother you.” For OHIP, the score ranged from 0 to 4, where 0 denoted never/I don’t know; 1, hardly ever or nearly never; 2, occasionally; 3, fairly often or many times; and 4, very often. No financial incentives were provided for answering the questionnaire.

We used 5 major quality success criteria: *facial appearance* (OQoLQ: Q1, 7, 10, 11, 14; OHIP: Q10, 11), *jaw function* (OQoLQ: Q2-6; OHIP: Q3), *snoring* (OHIP: Q9, 12-14), *breathing* (OHIP: Q7, 12-14) and *speech* (OHIP: Q1, 3, 5-6, 12-14) were derived from the OQoLQ and OHIP questionnaires and analyzed to compare pre- and postdistraction scores in different subgroups of distraction.

The results were analyzed using descriptive statistics and making comparisons among various subgroups.

Quantitative data were summarized as mean \pm SD and attributes as frequency (percentages). Student’s paired *t* test was used to compare pre- and postdistraction scores, and an unpaired *t* test was used to compare scores between subgroups. Analysis was done with the help of SPSS statistical software (Version 23, IBM Corp., Armonk, NY, USA) and Microsoft Excel software. *P* value $<$.05 was taken as the significance level.

RESULTS

All 42 patients analyzed in our study completed their 2 years of regular follow-up and had bony TMJ ankylosis, with trauma or ear infection as the cause in 38 and 4 patients, respectively. Among these patients, 16 were female and 26 male, mean age was 14.98 ± 4.88 years, and all had prearthroplastic distraction. The shortening in the mandible was in the proportion of 29:01:12 in the body, ramus, and ramus-body, respectively.

Distraction was performed as per the need and plan, either using external or internal distraction devices in the ratio of 1.2:1, bilateral or unilateral in the ratio of 0.5:1, and multivector or linear distraction in the ratio of 0.35:1, and 38 patients had mandibular distraction with simultaneous maxillomandibular distraction performed in 4 cases with maxillary cant. (Figure 1).

Assessment of the 5 major factors, appearance, jaw function, snoring, breathing, and speech, performed by a single resident doctor, revealed significant results ($P <$.001) suggesting 100% success (Table I; Figures 2 and 3). There were minor complications such as scarring, which gradually faded with time, or temporary marginal mandibular nerve involvement in 1 patient, which also improved within 6 months.

Mean preoperative QoL was 68.52 ± 9.50 and postoperative was 26.62 ± 3.51 . There was a highly significant difference in the QoL score from the baseline preoperative score ($P <$.001) (Figure 4A). Mean preoperative OHIP was 33.88 ± 6.26 and postoperative was 15.36 ± 2.54 . There was a highly significant difference in all the OHIP questions postoperatively ($P <$.01) (Figure 4B). All QoL and OHIP questions postoperatively ($P <$.01) indicated significant improvement (Table II).

This comparison of QoL was measured between various types of distraction, including intraoral vs extraoral, unilateral vs bilateral, linear vs multivector, and maxillomandibular vs mandibular distraction (Table III). Postoperative mean overall QoL score among patients with extraoral distraction was 5.39 ± 0.58 , whereas with intraoral distraction it 5.68 ± 1.25 ; the difference in QoL among patients with intraoral or extraoral distractors was not significant ($P =$.06). In the unilateral vs bilateral distraction groups, there was a statistically significant improvement in QoL scores for appearance when distraction was performed

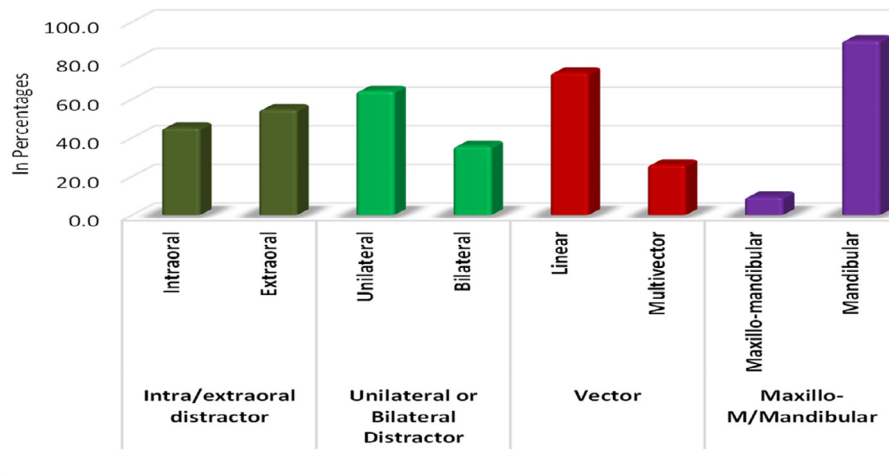


Fig. 1. Distribution of patients according to the distraction methods used.

bilaterally compared with unilaterally, but the overall QoL score had no significant difference.

When comparing between the linear vs multivector distraction groups, there was a significant improvement in QoL score for jaw function and the overall QoL score in the multivector group. In the maxillomandibular vs mandibular distraction groups, there was a significant improvement in appearance and jaw function QoL score postoperatively in the maxillomandibular distraction group (Table III). Also, total QoL score differences (pre- to postdistraction) among various categories were assessed and had significant improvements in bilateral compared with unilateral ($P = .004$) and maxillomandibular distraction compared with mandibular distraction alone ($P = .047$; Table IV).

DISCUSSION

Facial deformity may occur as a result of congenital or developmental disorders, TMJ ankylosis, hemifacial

Table I. Pre- and postdistraction comparison of success criteria in TMJ ankylosis patients (n = 42)

Success criteria	Time	Mean score*	SD	t	P
Appearance	Pre	3.90	0.30	41.52	<.001
	Post	1.14	0.35		
Jaw function	Pre	3.40	0.59	23.56	<.001
	Post	1.31	0.47		
Snoring	Pre	2.98	0.81	15.92	<.001
	Post	1.02	0.15		
Breathing	Pre	3.00	0.80	16.41	<.001
	Post	1.02	0.15		
Speech	Pre	3.02	0.75	17.69	<.001
	Post	1.02	0.15		

TMJ, temporomandibular joint; SD, standard deviation.

*1 represents best grade and 4 represents worst, $P < .05$ denotes significance.

microsomia, and so on and may be corrected by orthognathic surgery or DO. McCarthy⁴ in 1989 was the first to clinically apply an external fixation device for mandibular distraction. However, today both external or internal fixation devices are commercially available and include linear or multivector devices, which are being applied unilaterally or bilaterally, with simultaneous maxillomandibular distraction or with mandibular distraction alone. This study was planned to evaluate the success of distraction, assess the psychosocial and well-being outcomes of DO and oral health in TMJ ankylosis patients with facial deformities; and discriminate the differences in QoL with application of external or internal, unilateral or bilateral, linear or multivector, and maxillomandibular or mandibular distraction devices.

Measurement of QoL was performed in these patients to relate improvement of patient's health quality and OHIP to assess their oral health. QoL after orthognathic surgery has been measured before, but there is little information on QoL and OHIP after maxillomandibular distraction. An Arabic version of the 22-item QoL questionnaire was used to compare pre- and postintervention score in 17 patients after orthognathic surgery and indicated significant improvement in QoL (all $P < .001$) and in its 4 domains (oral function, facial aesthetics, awareness of dentofacial aesthetics, and social aspects).⁵ Similarly, pre- and postoperative evaluation of QoL and self-esteem of 136 female orthognathic surgery patients was performed in Korea using OQoLQ and Rosenberg's self-esteem scale, where patients were distributed into 3 groups: minor malocclusion, class II, and class III. They found significantly better self-esteem and OQoLQ scores in minor malocclusion group than in class II or III malocclusion ($P < .01$) but no significant difference between class II and III malocclusion.⁶

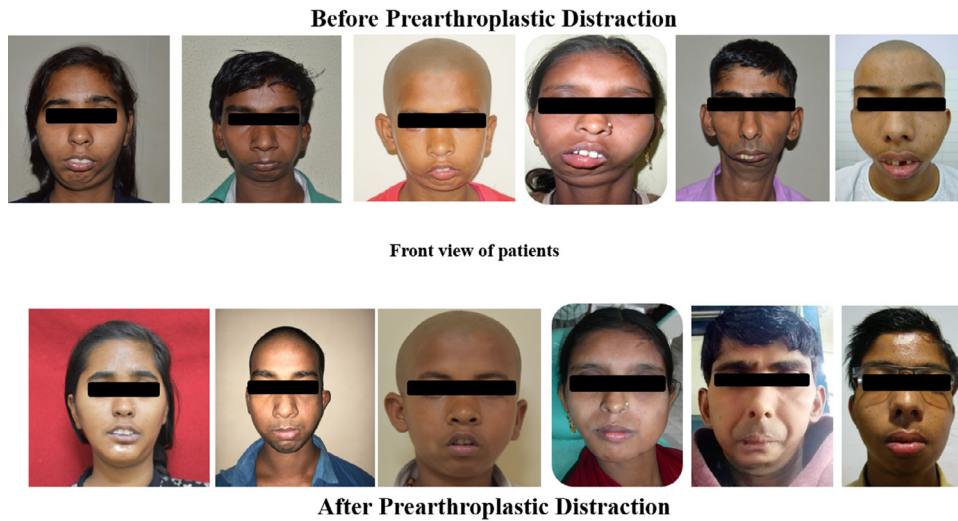


Fig. 2. Pre- and postdistraction frontal view of few patients.

Because there was no questionnaire available for assessing QoL after DO, we used the available OQoLQ translated in the local language in our patients.

In a prospective study in Sweden, 50 patients with skeletal malformations were assessed at 2 centers after orthognathic surgery using OHIP-14 and OQoLQ; both OQoLQ and OHIP significantly improved in all domains from preoperative to 6 months.⁷ When QoL was assessed in 65 orthognathic surgery patients using the Japanese version of OHIP- J54 before and after surgery; lower scores were recorded after surgery, suggesting improvement in QoL.⁸ In Thailand pre- and post-orthognathic surgery QoL was evaluated in 41 patients using the Oral Impact on Daily Performance (OIDP) index and condition-specific OIDP (CS-OIDP). Researchers found that QoL improved in a holistic way.⁹ In France, QoL, depression, and

anxiety were assessed before and after orthognathic surgery in 140 patients from 5 medical centers using the World Health Organization Quality of Life–BREF and the depression anxiety scale of the General Health Questionnaire-28.¹⁰ Researchers found that surgery could moderately improve the psychosocial QoL but suggested that systematic screening and treatment of depression could further improve QoL. Choi et al.¹¹ evaluated QoL in malocclusion patients using a Korean version of the OHIP-14 (OHIP-14K) and found that the older patients perceived their QoL more negatively than the teens ($P < .001$). They also found that as the severity of the malocclusion increased, oral health-related QoL and masticatory function worsened (OHIP-14K, $P < .001$; Food intake ability, $P < .05$)¹¹ Similar studies undertaken in 30 Turkish patients,¹² 117 patients in Brazil,¹³ 152 in

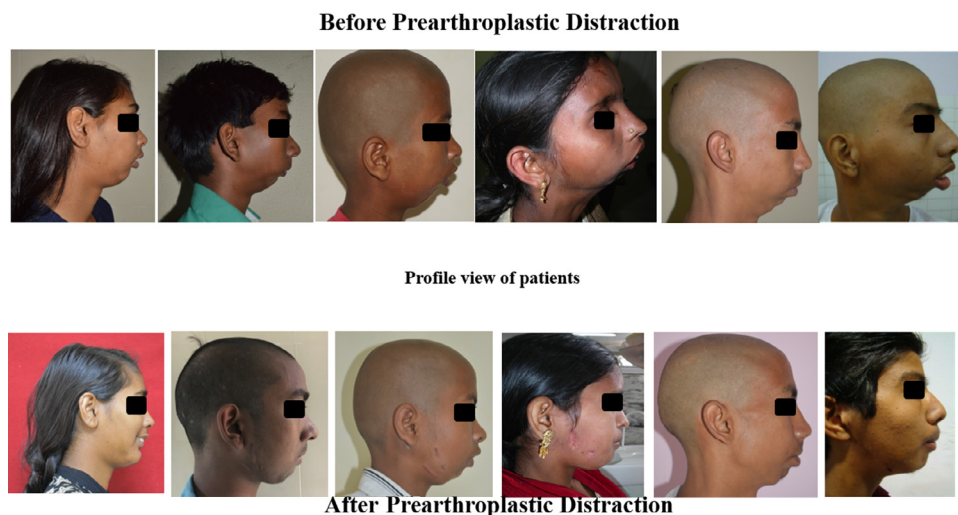


Fig. 3. Pre and postdistraction profile view of few patients.

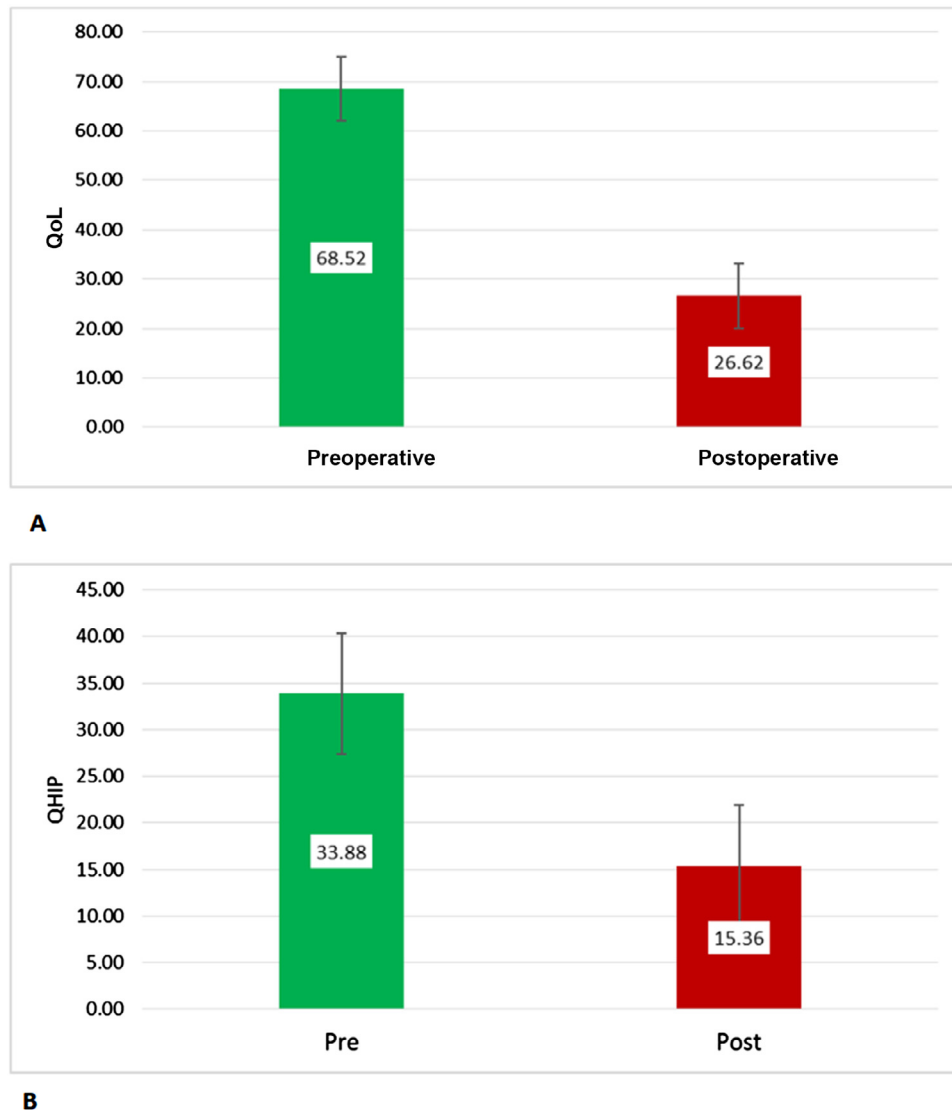


Fig. 4. Pre and postdistraction comparison of (A) quality of life (QoL) and (B) Oral Health Impact Profile (OHIP).

China,¹⁴ and 58 in Iran¹⁵ reported positive effects of orthognathic surgery on patients' QoL.

In our study there were statistically significant improvements ($P < .001$) in QoL and OHIP scores after distraction, similar to the findings of Lee et al.,¹⁶ who reported a significant improvement in OHIP-14 ($P < .001$) and OQoLQ mean scores ($P < .001$); and Rustemeyer et al.¹⁷ in Germany, who reported that oral health-5, "Have you felt self-conscious because of problems with your teeth, mouth or dentures?", was the most sensitive indicator for postoperative improvement of QoL. Soh and Narayanan¹⁸ completed a systematic review of QoL after orthognathic surgery but could not find any randomized clinical trials with controls, just the prospective, retrospective cohorts or case series, and hence emphasized the role of randomized controlled trials to generate higher levels of evidence,

objective assessment of the postoperative changes, and a longer follow-up.

QoL improvements after maxillofacial distraction depend on many factors such as mental and social well-being, state of health, and life circumstances. Earlier the QoL measures were based on simple assessments of physical abilities by an external rater, but with the current concept of health-related QoL, the patients themselves put their actual current situation in relation to their personal expectation, using validated questionnaires. Datta et al.¹⁹ performed a satisfaction audit in 13 patients undergoing mandibular distraction using extraoral distractor appliance. Hong et al.²⁰ retrospectively distributed the Glasgow Children's Benefit Inventory questionnaire to the caregivers of children undergoing mandibular DO and found a subjective overall benefit in health-related QoL after distraction.²¹

Table II. Pre- and postoperative comparison of QoL components among the prearthroplastic distraction cases (n = 42)

QoL		Mean	SD	Mean Diff.	t	P	OHIP	Mean	SD	Mean Diff.	t	P
Q1	Pre	3.17	1.08	1.88	10.78	<.001	Pre	2.69	0.87	1.67	12.36	<.001
	Post	1.29	0.46				Post	1.02	0.15			
Q2	Pre	3.45	0.86	2.26	17.70	<.001	Pre	1.31	0.64	0.31	3.12	.003
	Post	1.19	0.40				Post	1.00	0.00			
Q3	Pre	3.40	0.89	2.10	15.00	<.001	Pre	1.33	0.57	0.33	3.79	<.001
	Post	1.31	0.64				Post	1.00	0.00			
Q4	Pre	3.31	0.87	2.02	16.80	<.001	Pre	3.02	0.78	2.00	16.94	<.001
	Post	1.29	0.51				Post	1.02	0.15			
Q5	Pre	2.93	0.89	1.81	13.60	<.001	Pre	2.86	0.87	1.69	15.32	<.001
	Post	1.12	0.33				Post	1.17	0.38			
Q6	Pre	2.10	1.10	0.98	5.27	<.001	Pre	2.57	0.97	1.24	12.24	<.001
	Post	1.12	0.33				Post	1.33	0.53			
Q7	Pre	3.14	0.87	2.07	15.49	<.001	Pre	2.57	0.86	1.50	12.58	<.001
	Post	1.07	0.26				Post	1.07	0.26			
Q8	Pre	2.48	1.27	1.00	6.73	<.001	Pre	1.52	0.71	0.52	4.80	<.001
	Post	1.48	0.51				Post	1.00	0.00			
Q9	Pre	2.76	1.01	1.38	10.15	<.001	Pre	2.33	1.14	1.12	7.92	<.001
	Post	1.38	0.49				Post	1.21	0.42			
Q10	Pre	3.57	0.77	2.38	20.21	<.001	Pre	2.98	1.00	1.90	12.56	<.001
	Post	1.19	0.40				Post	1.07	0.26			
Q11	Pre	3.38	0.66	2.21	23.67	<.001	Pre	2.69	0.60	1.57	18.60	<.001
	Post	1.17	0.38				Post	1.12	0.33			
Q12	Pre	2.69	0.84	1.55	14.22	<.001	Pre	2.62	0.62	1.52	15.58	<.001
	Post	1.14	0.35				Post	1.10	0.30			
Q13	Pre	3.00	0.80	1.79	15.43	<.001	Pre	2.60	0.70	1.48	15.09	<.001
	Post	1.21	0.42				Post	1.12	0.33			
Q14	Pre	3.64	0.62	2.12	18.58	<.001	Pre	2.79	1.00	1.67	11.98	<.001
	Post	1.52	0.74				Post	1.12	0.33			
Q15	Pre	3.24	0.93	2.00	13.46	<.001						
	Post	1.24	0.62									
Q16	Pre	2.86	1.07	1.71	11.17	<.001						
	Post	1.14	0.35									
Q17	Pre	3.33	0.82	2.00	15.68	<.001						
	Post	1.33	0.48									
Q18	Pre	3.00	1.01	1.90	11.70	<.001						
	Post	1.10	0.30									
Q19	Pre	3.10	0.91	2.10	15.00	<.001						
	Post	1.00	0.00									
Q20	Pre	3.43	0.91	2.33	16.77	<.001						
	Post	1.10	0.30									
Q21	Pre	3.24	0.66	2.24	22.13	<.001						
	Post	1.00	0.00									
Q22	Pre	3.31	1.00	2.07	14.57	<.001						
	Post	1.24	0.43									

P < .05 denotes significance.

QoL, quality of life; SD, standard deviation; OHIP, Oral Health Impact Profile.

However, in our study, QoL and OHIP improvements were prospectively assessed in 42 patients and scores were improved for facial appearance, jaw function, sleep, breathing, speech, and overall psychosocial well-being.

When QoL scores were assessed for different sub-groups, our findings were found to be statistically significant for improvement in facial appearance in bilateral distraction group, jaw function and overall well-being in multivector distraction group, appearance, jaw function, and overall well-being in the

maxillomandibular distraction group. These observations are well justified and prove that the chosen distraction plan was able to fulfil the requirement. Thus there comes the role of good planning. Choice of intraoral or extraoral distraction was based on patients' choice for distraction requirements of up to 15 millimeter (mm) distraction; if more distraction was required, extraoral distraction was used. Distractor placement was unilateral for cases requiring up to a centimeter (cm) of distraction, or in asymmetric deformity cases, but if more than 1 cm of distraction was required, or in

Table III. Comparison of quality factors between intraoral and extraoral, unilateral and bilateral, linear and multivector, and maxillo-mandibular and mandibular distraction cases (n = 42)

Major quality factor (n = 42)	Intraoral (n = 19)		Extraoral (n = 23)		Unilateral (n = 27)		Bilateral (n = 15)		Linear (n = 31)		Multivector (n = 11)		Maxillo-mandibular (n = 4)		Mandibular (n = 38)		P	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD		
Appearance	Pre	3.89	0.32	3.91	0.29	3.89	0.32	3.93	0.26	3.94	0.25	3.82	0.40	3.75	0.50	3.92	0.27	.279
	Post	1.16	0.37	1.13	0.34	1.22	0.42	1.00	0.00	1.16	0.37	1.09	0.30	1.00	0.00	1.16	0.37	.012
Jaw function	Pre	3.58	0.51	3.26	0.62	3.41	0.64	3.40	0.51	3.48	0.57	3.18	0.60	2.75	0.50	3.47	0.56	.017
	Post	1.37	0.50	1.26	0.45	1.30	0.47	1.33	0.49	1.39	0.50	1.09	0.30	1.00	0.00	1.34	0.48	<.001
Snoring	Pre	3.11	0.81	2.87	0.81	3.55	0.78	3.47	0.64	3.03	0.80	2.82	0.87	2.25	0.50	3.05	0.80	.059
	Post	1.05	0.23	1.00	0.00	1.04	0.19	1.00	0.00	1.03	0.18	1.00	0.00	1.00	0.00	1.03	0.16	.750
Breathing	Pre	3.11	0.81	2.91	0.79	3.43	0.76	3.47	0.64	3.03	0.80	2.91	0.83	2.25	0.50	3.08	0.78	.046
	Post	1.05	0.23	1.00	0.00	1.04	0.19	1.00	0.00	1.03	0.18	1.00	0.00	1.00	0.00	1.03	0.16	.750
Speech	Pre	2.95	0.85	3.09	0.67	2.89	0.70	3.27	0.80	3.03	0.75	3.00	0.77	2.50	0.58	3.08	0.75	.143
	Post	1.05	0.23	1.00	0.00	1.04	0.19	1.00	0.00	1.03	0.18	1.00	0.00	1.00	0.00	1.03	0.16	.750
Overall	Pre	16.63	2.73	16.04	2.62	15.63	2.65	17.53	2.26	16.52	2.50	15.73	3.10	16.32	2.94	16.29	2.05	.968
	Post	5.68	1.25	5.39	0.58	5.63	1.11	5.33	0.49	5.65	1.05	5.18	0.40	5.25	0.80	6.21	0.43	<.001

P < .05 denotes significance.
SD, standard deviation.

cases of symmetric deformity, bilateral distraction was undertaken. Multivector distraction was used for cases requiring distraction in both vertical and horizontal direction, which means for both mandibular ramus and body distraction, whereas linear distraction was preferred in cases of mild to moderate cases of TMJ ankylosis presenting with sleep apnea. Maxillomandibular distraction was undertaken in cases where maxillary cant correction was also required.

Tsui et al.²² longitudinally evaluated QoL changes in 18 patients with moderate to severe obstructive sleep apnea randomly allocated to 2 groups, sagittal split ramus osteotomy and mandibular DO, using the Epworth Sleepiness Scale, Calgary Sleep Apnea Quality of Life Index, Functional Outcomes of Sleep Questionnaire, and 36-item Short Form Health Survey and found no significant difference in QoL scores of the 2 experimental groups. Our distraction groups either had different types of distraction devices or placement of distraction was different and revealed statistically significant differences in the preoperative to postoperative changes, with better outcomes in bilateral distraction group compared with unilateral distraction and in maxillomandibular distraction compared with mandibular distraction alone in cases of TMJ ankylosis.

Kumar et al.²³ evaluated QoL after DO before release of ankylosis in 10 patients presenting with sleep apnea and facial asymmetry secondary to TMJ ankylosis and found marked improvement in the QoL scores, which changed from very poor to very satisfactory (P < .001). In our study, all patients received prearthroplastic distraction with 100% success. Complications did occur but were minor and resolved within very few months.

QoL of patients who underwent midface distraction after LeFort osteotomies was assessed using FACE-Q and a functional survey in 128 patients, of whom 64 had internal and other 64 had external distraction. Internal device patients had superior FACE-Q scores for Social Function (80.9 vs 68.9), Early Life Impact (92.9 vs 62.4), Dental Anxiety (70.2 vs 48.3), Psychological Well-being (87.8 vs 68.6), and Decision Satisfaction (81.2 vs 56.9) and Outcome Satisfaction (91.0 vs 84.7).²⁴ However, in our study we found no significant difference in overall QoL score between patients with extraoral or intraoral distractors.

Although the strength of our study lies in its large number of patients enrolled with 2 years of follow-up and a single doctor who interviewed the patients, it does have certain limitations. There is a risk of bias because the interviewer was not blinded. The groups compared were neither matched nor had equal number of participants because TMJ ankylosis is a complex problem and differs in every individual, so comparison of QoL score among different individuals could vary

Table IV. Comparison of total QoL score differences (pre- to postoperative) among various categories (n = 42)

Group	Category	Total score difference pre- to postoperative	t	P	
Intraoral vs extraoral distraction	Intraoral (n = 19)	10.95	2.48	0.39	.701
	Extraoral (n = 23)	10.65	2.44		
Unilateral vs bilateral distraction	Unilateral (n = 27)	10.00	2.29	-3.08	.004
	Bilateral (n = 15)	12.20	2.08		
Linear vs Multivector distraction	Linear (n = 31)	10.87	2.22	0.38	.708
	Multivector (n = 11)	10.55	3.08		
Maxillomandibular vs Mandibular distraction	Maxillomandibular (n = 4)	8.50	2.08	-2.05	.047
	Mandibular (n = 38)	11.03	2.37		

P < .05 denotes significance.

QoL, quality of life.

based on the severity of the deformity. Also, we did not compare QoL improvement after prearthroplastic or postarthroplastic distraction because all our patients underwent prearthroplastic distraction. However, we may conclude that distraction osteogenesis in TMJ ankylosis patients, when planned and performed well, results in an overall benefit in health-related QoL.

CONCLUSIONS

Distraction osteogenesis considerably improves oral health and health-related QoL in patients with TMJ ankylosis with facial deformities. The use of an external or internal distractor does not make any difference in the QoL; however, bilateral distraction, multivector distraction, and maxillomandibular distraction resulted in better QoL outcomes.

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DISCLOSURE

Ethical approval for this study was given by Institution Ethics Committee, King George's Medical University, U.P., and the ethical reference no. is 879/Ethics/16.

SUPPLEMENTARY MATERIALS

Supplementary material associated with this article can be found in the online version at doi:10.1016/j.oooo.2020.09.005.

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