**European Journal of Clinical Pharmacy**
**Print ISSN:** 2385-409X, **Online ISSN**: 3105-0409
Website: https://farmclin.com/

# Conservative Treatment Options For Mandibular Condyle Fractures: Imf-Screws Or Arch Bars: Considerations For Patient Quality Of Life

***Article History:***

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***Received***: 22-11-2025
***Revised***: 06-12-2025
***Accepted***: 16-12-2025
***Published***: 30-12-2025



***Abstract:*** ***Background:*** Intermaxillary fixation (IMF) is commonly used in the conservative management of mandibular condylar fractures. Arch bars are effective but may cause discomfort and require extensive dental wiring. IMF screws offer a simpler alternative, but their effect on functional recovery and oral health-related quality of life requires further evaluation. This study compared arch bars and IMF screws in patients with mandibular condylar fractures.***Methods:*** This randomized controlled trial was conducted at the Department of Oral and Maxillofacial Surgery, LUMHS, Jamshoro/Hyderabad, over six months. A total of 224 patients aged 20–48 years were randomly allocated equally to arch bar (n=112) or IMF screw (n=112) fixation. Pain, maximum mouth opening (MMO), mandibular movement, occlusion, and oral health-related quality of life assessed using the General Oral Health Assessment Index (GOHAI) were evaluated during follow-up. The primary outcome was GOHAI score at six months.***Results:*** Baseline demographic and clinical characteristics were comparable between groups. GOHAI scores were significantly higher in the IMF screw group at weeks 1, 3, and 6 (44.1 ± 5.2 vs. 39.7 ± 5.8; 47.0 ± 4.9 vs. 42.8 ± 5.4; and 50.3 ± 4.6 vs. 47.1 ± 5.0; all $p<0.001$). This difference remained significant at three and six months ($p=0.038$ and $p=0.048$). Pain scores were also lower with IMF screws during early follow-up. At six months, MMO was greater with IMF screws (41.2 ± 3.5 vs. 39.8 ± 3.7 mm; $p=0.004$).***Conclusion:*** IMF screws were associated with better early oral health-related quality of life, less postoperative pain, and greater mouth opening than arch bars, suggesting better patient comfort and functional recovery.

***Keywords:*** Mandibular condylar fractures; Intermaxillary fixation; IMF screws; Arch bars; Oral health-related quality of life; GOHAI; Pain; Maximum mouth opening.

## INTRODUCTION

Facial bone fractures are among the most frequently encountered traumatic injuries, with nasal bone fractures being the most common, followed by fractures of the mandible. Among mandibular fractures, condylar fractures represent one of the most frequently affected anatomical sites. The structural configuration of the mandible may result in indirect fractures, particularly at the condyle or angle, opposite to the site of impact.[1]

Mandibular condylar fractures (MCFs) commonly occur following physical trauma and may occasionally result from pathological conditions, such as infections or tumors. These fractures can lead to significant functional and aesthetic complications, including pain, malocclusion, restricted mandibular movements, difficulty in mastication and speech, and facial asymmetry.2 Therefore, appropriate diagnosis and management are essential to restore normal mandibular function and achieve satisfactory clinical outcomes. The choice of treatment depends on several factors, including the type and location of the fracture, degree of displacement or dislocation, associated injuries, dentition, and individual patient characteristics.3

Condylar fractures are broadly classified as extracapsular or intracapsular fractures and may be further categorized according to their anatomical location and severity. The Spiessl and Schroll classification system, developed in 1972, remains one of the widely used systems for categorizing mandibular condylar fractures. It classifies these fractures into six types: Type I, fracture without dislocation; Type II, low condylar neck fracture with dislocation; Type III, high condylar neck fracture with dislocation; Type IV, low condylar neck fracture with luxation; Type V, high condylar neck fracture with luxation; and Type VI, intracapsular fracture.4,5

The management of mandibular condylar fractures remains a subject of considerable clinical interest and may involve conservative treatment, intermaxillary fixation (IMF), or open reduction and internal fixation. The selection of a treatment approach often depends on the characteristics of the fracture as well as the clinical judgment and experience of the treating surgeon.6,7 Conservative management frequently involves stabilization of the dental arches using techniques such as arch bars or intermaxillary fixation screws (IMFS). These methods help establish and maintain proper occlusion and provide stabilization during the healing process.8,9

Arch bars have traditionally been widely used for intermaxillary fixation. Although they are effective in achieving stabilization and restoring occlusion, their use may be associated with several disadvantages, including prolonged application time, difficulty in maintaining oral hygiene, soft tissue irritation, gingival injury, discomfort, and dietary restrictions. These limitations may adversely affect the patient's overall experience during treatment. In recent years, IMF screws have emerged as an alternative method of achieving intermaxillary fixation. Compared with conventional arch bars, IMF screws may offer advantages such as easier application and removal, shorter operative time, improved maintenance of oral hygiene, and reduced soft tissue trauma. However, complications such as screw loosening, root injury, and limitations in their use in certain clinical situations have also been reported.3-7

Quality of life (QOL) has increasingly become an important consideration in the management of maxillofacial trauma. Successful treatment should not only result in fracture healing and restoration of occlusion but should also minimize the impact of treatment on the patient's daily life. The use of arch bars and IMF screws may influence several aspects of QOL, including pain, discomfort, oral hygiene, dietary limitations, speech difficulties, social interaction, and overall satisfaction with treatment. Arch bars, in particular, may cause considerable discomfort and interfere with routine oral hygiene and dietary practices, thereby negatively affecting patients' perceived quality of life during the treatment period.9

To overcome some of the limitations associated with conventional arch bars, IMF screws have been increasingly introduced as an alternative method for achieving intermaxillary fixation. Previous studies comparing these techniques have reported that IMF screws may be associated with reduced pain, shorter operative time, improved oral hygiene, and satisfactory restoration of occlusion when compared with arch bars. Van den Bergh et al. reported that both techniques were associated with certain complications; however, the use of IMF screws demonstrated potential advantages in terms of patient comfort, reduced treatment time, and occlusal outcomes.10

Despite the availability of different methods for conservative management of mandibular condylar fractures, evidence regarding their comparative impact on patients' quality of life remains limited. Most clinical evaluations have traditionally focused on fracture healing, restoration of occlusion, and functional outcomes, whereas patient-centered outcomes such as pain, discomfort, dietary limitations, speech difficulties, and satisfaction with treatment require further attention.

Therefore, the present study aimed to compare the quality of life of patients undergoing conservative

treatment for mandibular condylar fractures using arch bars and intermaxillary fixation screws. By evaluating patient-reported outcomes related to functional limitations, pain and discomfort, dietary restrictions, speech difficulties, and satisfaction with treatment, this study sought to determine which method provides a more favorable overall treatment experience and may contribute to improved patient-cantered outcomes in the management of mandibular condylar fractures.

## METHODOLOGY

This randomized controlled trial was conducted in the Department of Oral and Maxillofacial Surgery, Liaquat University of Medical and Health Sciences (LUMHS), Jamshoro/Hyderabad. The study was conducted over a period of six months following approval of the study protocol by the Institutional Research Ethics Committee of LUMHS. Patients presenting with mandibular condylar fractures and fulfilling the predefined eligibility criteria were assessed for participation.

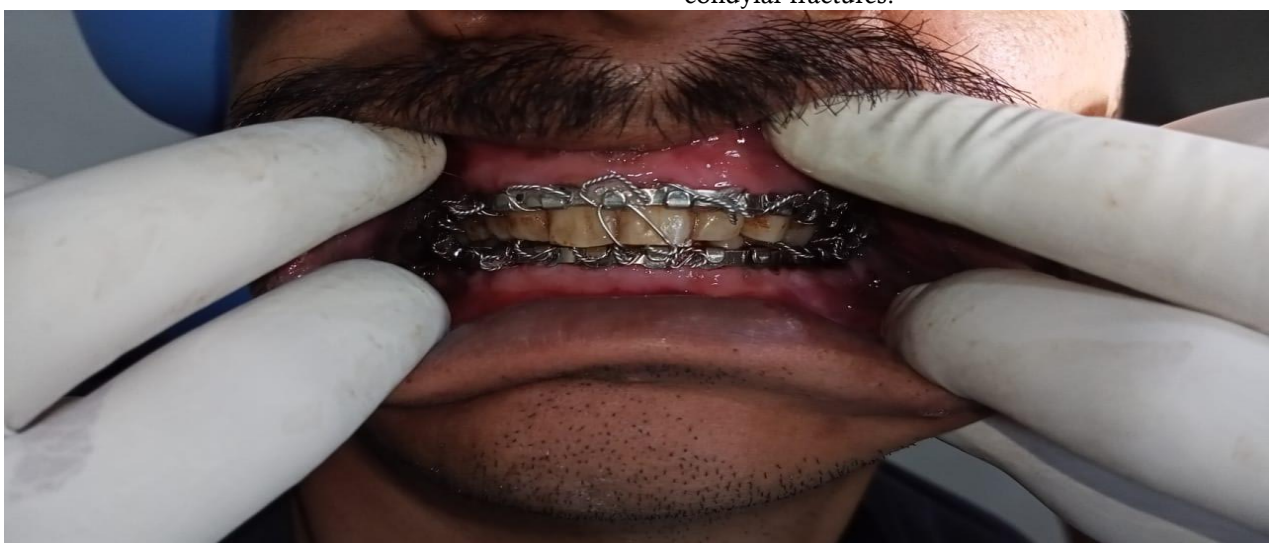
Patients of either sex, aged 20–48 years, who presented with a mandibular condylar fracture were considered eligible for inclusion. Patients were included after providing written informed consent. Patients with uncontrolled diabetes mellitus, uncontrolled asthma, chronic renal failure, concomitant maxillary or other facial fractures, inflammatory or autoimmune diseases, or neurological disorders were excluded. Patients classified as American Society of Anesthesiologists (ASA) physical status I–III were eligible for participation.

The sample size was calculated using the WHO sample size calculator for comparison of two independent means. Assuming a mean outcome of $1.35 \pm 0.4$ in the arch bar group and $1.20 \pm 0.4$ in the IMF-screw group, with a two-sided confidence level of 95%, 80% power, and an equal allocation ratio, the required sample size was 224 participants. Accordingly, 112 patients were allocated to each treatment group. Participants were recruited using consecutive sampling.

After eligibility was confirmed and informed consent was obtained, participants were randomly assigned in a 1:1 ratio to either the arch bar group or the IMF-screw group. A computer-generated randomization sequence was prepared before recruitment. Allocation concealment was maintained using sequentially numbered, opaque, sealed envelopes, which were opened only after the participant had been enrolled. This procedure was adopted to minimize selection bias and ensure that treatment allocation was not known in advance.

Patients allocated to the IMF-screw group underwent intermaxillary fixation using appropriately positioned IMF screws. The screws were inserted into suitable interproximal or edentulous areas near the mucogingival junction, with the insertion sites selected according to the clinical and radiographic findings. Intermaxillary fixation was subsequently established using stainless-steel wires passed through or around the screws positioned in the maxilla and mandible.

In the arch bar group, arch bars were secured to the teeth using stainless-steel wires extending from the canine/cusp region to the second molar region, where the teeth were available and suitable for fixation. Intermaxillary fixation was then achieved by securing the mandible to the maxilla with stainless-steel wires attached to the extensions of the arch bars. Both groups received the conservative treatment protocol routinely followed in the department for mandibular condylar fractures.



**Figure#1: Conservative Management of Mandibular Condylar Fracture using Arch Bar**

**Figure#2: Conservative Management of Mandibular Condylar Fracture using IMF-Screws**

Patients were followed clinically on a weekly basis for the first six postoperative weeks and were subsequently assessed at three and six months. The primary outcome was patient-reported quality of life at six months. Secondary outcomes included pain intensity, maximum mouth opening, mandibular mobility and deviation, and occlusal status.

Pain intensity was assessed using a 10-cm Visual Analog Scale (VAS), with 0 representing no pain and 10 representing the worst imaginable pain. For descriptive interpretation, pain scores of 1–3 were considered mild, 4–6 moderate, and 7–10 severe. Pain was assessed at baseline and during postoperative follow-up visits, particularly at weeks 1, 3, and 6.

Maximum mouth opening (MMO) was assessed by measuring the interincisal distance between the upper and lower central incisors using a calibrated ruler or caliper and was recorded in millimeters. Mandibular movement was evaluated clinically by asking patients to open and close their mouths while observing the range and direction of mandibular movement. Any deviation toward the fractured side or other limitation in mandibular movement was documented. Occlusion was assessed clinically by examining the relationship between the maxillary and mandibular teeth. The presence of postoperative malocclusion, including anterior or unilateral open bite, was recorded.

Quality of life was assessed using the General Oral Health Assessment Index (GOHAI), a validated patient-reported questionnaire designed to evaluate perceived oral health and its effect on daily functioning. The GOHAI consists of 12 items covering three major domains: physical functioning, including eating, speaking, and swallowing; psychosocial functioning, including concerns about oral health, social interaction, and psychological well-being; and pain or discomfort. Each item was scored according to the frequency of the reported problem using a five-point response scale ranging from "always" to "never." The responses were combined to obtain an overall GOHAI score, with higher scores indicating better perceived oral health-related quality of life.

The GOHAI questionnaire was administered to participants at baseline and during follow-up at postoperative weeks 1, 3, and 6, and at 3 and 6 months. The 6-month GOHAI score was considered the primary quality-of-life outcome and was used to compare the impact of arch bars and IMF screws on patients' oral health-related quality of life. The questionnaire was completed by the participants themselves, with assistance from the study team provided when clarification of individual questions was required without influencing their responses.

Demographic and clinical information was recorded using a structured data collection form. Variables included age, sex, occupation, fracture characteristics, treatment allocation, pain score, maximum mouth opening, mandibular deviation, occlusal status, and quality-of-life responses. All assessments were performed during scheduled follow-up visits. Any treatment-related problems or complications observed during follow-up were also documented.

Data were entered and analyzed using SPSS version-26. Continuous variables were assessed were expressed as mean ± standard deviation. Categorical variables were presented as frequencies and percentages.

Baseline characteristics were compared between the arch bar and IMF-screw groups to assess the comparability of the two treatment groups. For comparison of continuous variables between groups, the independent-samples t-test was used. Categorical variables, including occlusal status and treatment-related complications, were compared using the chi-square test or Fisher's exact test, as appropriate. Changes in pain, maximum mouth opening, and

quality-of-life outcomes across follow-up assessments were analyzed using appropriate repeated-measures methods. p-value of ≤0.05 was considered statistically significant.

## RESULTS

A total of 224 patients were included, with 112 patients each in the arch bar and IMF screw groups. The mean age was comparable between the arch bar and IMF screw groups (32.4 ± 7.1 vs. 32.1 ± 7.3 years; p=0.76), with most participants aged 30–39 years. Males predominated in both groups (60.7% vs. 58.9%; p=0.79), and most participants were urban residents (62.5% vs. 59.8%; p=0.68). The majority of patients were classified as ASA I in both groups (69.6% vs. 67.9%), with no significant difference in ASA classification (p=0.88). Overall, the baseline demographic and clinical characteristics were comparable between the two groups **(Table#1)**.

The clinical characteristics of patients were comparable between the arch bar and IMF screw groups. Road traffic accidents were the most common mechanism of injury in both groups (58.0% vs. 59.8%), followed by falls and assaults (p=0.82). The distribution of fracture side was also similar, with right- and left-sided fractures accounting for the majority of cases (p=0.94). Condylar neck fractures were the most frequently observed fracture type in both groups (49.1% vs. 47.3%), followed by subcondylar fractures (39.3% vs. 40.2%), with no significant difference in fracture location (p=0.87). Most fractures were moderately displaced in both groups (52.7% vs. 50.0%; p=0.77). Concomitant mandibular fractures and pre-treatment malocclusion were observed at comparable frequencies between the groups (p=0.76 and p=0.85, respectively). Baseline maximum mouth opening, VAS pain scores, and GOHAI scores were also similar between the arch bar and IMF screw groups (all p>0.05), indicating that the two groups were clinically comparable before treatment **(Table#2)**.

Baseline GOHAI scores were comparable between the arch bar and IMF screw groups (45.8 ± 5.1 vs. 46.1 ± 5.0; p=0.66). At weeks 1, 3, and 6, GOHAI scores were significantly higher in the IMF screw group than in the arch bar group (44.1 ± 5.2 vs. 39.7 ± 5.8; 47.0 ± 4.9 vs. 42.8 ± 5.4; and 50.3 ± 4.6 vs. 47.1 ± 5.0, respectively; all p<0.001). This difference persisted at 3 and 6 months, although it was smaller (p=0.038 and p=0.048, respectively). Pain scores were significantly lower in the IMF screw group at weeks 1, 3, and 6 (all p<0.001). At 6 months, maximum mouth opening was also greater in the IMF screw group than in the arch bar group (41.2 ± 3.5 vs. 39.8 ± 3.7 mm; p=0.004), indicating better functional recovery with IMF screws **(Table#3)**.

**Table1: Baseline Demographic Characteristics of Patients**

| Baseline Data | Arch bar (n=112) | IMF screws (n=112) | P-value |
|---|---|---|---|
| Age (years), mean ± SD | 32.4 ± 7.1 | 32.1 ± 7.3 | 0.76 |
| **Age groups, n (%)** | | | |
| 20–29 years | 34 (30.4%) | 36 (32.1%) | 0.91 |
| 30–39 years | 52 (46.4%) | 50 (44.6%) | |
| 40–48 years | 26 (23.2%) | 26 (23.2%) | |
| **Sex, n (%)** | | | |
| Male | 68 (60.7%) | 66 (58.9%) | 0.79 |
| Female | 44 (39.3%) | 46 (41.1%) | |
| **Residence, n (%)** | | | |
| Urban | 70 (62.5%) | 67 (59.8%) | 0.68 |
| Rural | 42 (37.5%) | 45 (40.2%) | |
| **ASA class, n (%)** | | | |
| I | 78 (69.6%) | 76 (67.9%) | 0.88 |
| II | 31 (27.7%) | 33 (29.5%) | |
| III | 3 (2.7%) | 3 (2.7%) | |

**Table2: Clinical Characteristics of Patients**

| Clinical characteristic | Arch bar (n=112) | IMF screws (n=112) | p-value |
|---|---|---|---|
| **Mechanism of injury, n (%)** | | | |
| Road traffic accident | 65 (58.0%) | 67 (59.8%) | 0.82 |
| Fall | 25 (22.3%) | 23 (20.5%) | |
| Assault | 14 (12.5%) | 13 (11.6%) | |
| Other | 8 (7.1%) | 9 (8.0%) | |
| **Side of fracture, n (%)** | | | |
| Right | 49 (43.8%) | 48 (42.9%) | 0.94 |
| Left | 47 (42.0%) | 49 (43.8%) | |
| Bilateral | 16 (14.3%) | 15 (13.4%) | |
| **Fracture location, n (%)** | | | |
| Head | 13 (11.6%) | 14 (12.5%) | 0.87 |
| Neck | 55 (49.1%) | 53 (47.3%) | |
| Subcondylar | 44 (39.3%) | 45 (40.2%) | |
| **Displacement, n (%)** | | | |
| Minimally displaced | 36 (32.1%) | 38 (33.9) | 0.77 |
| Moderately displaced | 59 (52.7%) | 56 (50.0) | |
| Severely displaced | 17 (15.2%) | 18 (16.1) | |
| Concomitant mandibular fracture, n (%) | 31 (27.7) | 33 (29.5) | 0.76 |
| Pre-treatment malocclusion, n (%) | 18 (16.1) | 17 (15.2) | 0.85 |
| Baseline maximum mouth opening (mm), mean ± SD | 24.7 ± 4.1 | 24.9 ± 4.0 | 0.72 |
| Baseline VAS pain score, mean ± SD | 5.8 ± 1.3 | 5.7 ± 1.4 | 0.61 |
| Baseline GOHAI score, mean ± SD | 45.8 ± 5.1 | 46.1 ± 5.0 | 0.66 |

**Table 3. Comparison of GOHAI, Pain, and Maximum Mouth Opening Outcomes Between Arch Bar and IMF Screw Groups**

| Outcome | Arch bars (n=112) | IMF screws (n=112) | p-value |
|---|---|---|---|
| Baseline GOHAI | 45.8 ± 5.1 | 46.1 ± 5.0 | 0.66 |
| GOHAI week 1 | 39.7 ± 5.8 | 44.1 ± 5.2 | <0.001 |
| GOHAI week 3 | 42.8 ± 5.4 | 47.0 ± 4.9 | <0.001 |
| GOHAI week 6 | 47.1 ± 5.0 | 50.3 ± 4.6 | <0.001 |
| GOHAI month 3 | 53.8 ± 4.0 | 54.9 ± 3.8 | 0.038 |
| GOHAI month 6 | 56.7 ± 2.8 | 57.4 ± 2.5 | 0.048 |
| VAS pain week 1 | 6.1 ± 1.3 | 4.9 ± 1.4 | <0.001 |
| VAS pain week 3 | 3.7 ± 1.1 | 2.8 ± 1.0 | <0.001 |
| VAS pain week 6 | 1.9 ± 0.8 | 1.4 ± 0.7 | <0.001 |
| Maximum mouth opening, 6 months (mm) | 39.8 ± 3.7 | 41.2 ± 3.5 | 0.004 |

## DISCUSSION

In the present study, the two groups were comparable with respect to baseline demographic and clinical characteristics, including age, sex, ASA status, mechanism of injury, fracture pattern, displacement, malocclusion, maximum mouth opening, pain and GOHAI score. This comparability provides a reasonable basis for attributing the differences observed during follow-up to the method of intermaxillary fixation. The predominance of young males and road traffic accidents in our study is consistent with previous reports describing mandibular fractures as predominantly affecting young adult males, with road traffic accidents being a major cause.11-13

The main finding of this study was the better GOHAI scores in the IMF screw group during the first 6 weeks. The difference was greatest during the early

postoperative period and gradually became smaller at 3 and 6 months. This suggests that IMF screws may provide better early patient comfort and oral functional recovery than conventional arch bars. Similar findings have been reported in studies comparing patient experience with the two techniques, where IMF screws were associated with greater comfort and better oral hygiene.14,15 A randomized clinical study of patients with condylar fractures also reported better quality-of-life outcomes with IMF screws compared with arch bars.16 These findings support the improvement in GOHAI observed in our patients.

Pain was significantly lower in the IMF screw group at weeks 1, 3 and 6. This may be related to reduced gingival irritation and the absence of multiple interdental wires required for arch bar fixation. Previous studies have also reported less postoperative discomfort and pain with IMF screws.14,15,17 A recent randomized prospective study similarly found differences in postoperative pain between the two techniques and reported shorter operative time with IMF screws.18 Thus, the lower pain scores in our study appear clinically consistent with the existing literature.

At 6 months, maximum mouth opening was significantly greater in the IMF screw group. Although the difference was relatively small, it indicates better functional recovery. This may be particularly relevant in patients with condylar and subcondylar fractures, where restriction of mandibular movement is common. Previous literature has emphasized mouth opening as an important outcome following mandibular condylar fractures and has reported satisfactory functional recovery with appropriate fixation and rehabilitation.19,20 The present findings therefore suggest that the advantages of IMF screws may extend beyond the early postoperative period.

Another important advantage of IMF screws is their technical simplicity. Compared with arch bars, screws can generally be placed and removed more quickly and avoid extensive interdental wiring. Studies have consistently reported shorter application times with IMF screws.14,17,21 A meta-analysis also demonstrated significantly longer application and removal times with arch bars and a substantially higher risk of glove perforation.12 These advantages may improve operative efficiency and reduce occupational exposure to needle-stick injuries.

However, IMF screws should not be considered universally superior. Screw-related complications, including root injury, screw loosening, mucosal coverage and screw fracture, have been reported.17,12 In contrast, arch bars provide reliable fixation and may remain preferable in patients requiring prolonged or stronger intermaxillary stabilization. Previous systematic reviews have therefore concluded that the available evidence is not sufficient to recommend one technique for all patients.13,14 The choice should be based on fracture pattern, dentition, bone quality, treatment requirements and surgeon experience.

The strengths of this study include the relatively large sample size, equal distribution between the two groups, comparable baseline characteristics, and assessment of both patient-reported and functional outcomes over a 6-month period. However, the study has limitations, including its single-centre design and the possibility that fracture characteristics and compliance with postoperative rehabilitation may have influenced functional recovery. Technique-specific complications such as root injury, screw loosening, periodontal effects and operative time were also not evaluated. Future multicentre randomized studies with longer follow-up should assess these outcomes together with quality of life and cost-effectiveness.

## CONCLUSION

IMF screws were associated with less early postoperative pain, better GOHAI scores and slightly better long-term mouth opening than arch bars, suggesting that they are an effective and patient-friendly alternative for appropriately selected mandibular fracture patients.

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