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Research Article

Dry Needling versus Corticosteroid Injection for Lateral Epicondylitis in Rural Patients: A Retrospective Comparative Study

Dr. Rahil T Pasha[1], Dr Moinuddin Basha K[2], Dr. Meher Darakshan Punekar[3], Dr. Iram T Pasha[4*]

[1]Senior Resident, Nandi Medical College & Research Institute, Chikkaballapur, Karnataka, India
[2]Assistant Professor Hassan Institute of Medical Sciences, Hassan, Karnataka, India
[3]Senior Resident, Bangalore Medical College & Research Institute, Bengaluru, Karnataka, India
[4]Assistant Professor, Bangalore Medical College & Research Institute, Bengaluru, Karnataka, India
Corresponding Author: Dr. Iram T Pasha
Assistant Professor, Bangalore Medical College & Research Institute, Bengaluru, Karnataka, India.
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ABSTRACT

Introduction: Lateral epicondylitis is a common degenerative tendinopathy causing pain and functional disability, particularly among manual workers. Dry needling (DN) and corticosteroid injection (CSI) are frequently used after failure of conservative treatment, but comparative evidence in rural populations is limited.

Aim: To compare the clinical outcomes of dry needling and corticosteroid injection in patients with lateral epicondylitis from a predominantly rural population.

Materials and Methods: A retrospective comparative study was conducted at two tertiary teaching hospitals. Medical records of 90 patients with unilateral lateral epicondylitis treated with CSI (n=45) or DN (n=45) were reviewed. Pain, functional outcome, patient satisfaction, recurrence, and treatment-related complications were assessed using the Visual Analogue Scale (VAS), Patient-Rated Tennis Elbow Evaluation (PRTEE) score, and follow-up records.

Results: Both interventions significantly improved pain and function. CSI produced greater short-term improvement, with VAS decreasing from 6.81 to 1.25 and PRTEE from 59.81 to 10.46, compared with VAS reduction from 6.59 to 3.35 and PRTEE from 57.68 to 12.35 following DN. Recurrence was lower after DN (4.4%) than CSI (15.6%), while skin discoloration occurred only after CSI (15.6%; p=0.01). Patient satisfaction and overall clinical improvement were comparable between groups.

Conclusion: Both CSI and DN effectively improved pain and function. CSI offers faster short-term symptomatic relief, whereas DN demonstrates fewer complications and a lower recurrence trend, making it a valuable option for long-term management of lateral epicondylitis in rural patients.

Keywords: Lateral epicondylitis, dry needling, corticosteroid injection, rural population, visual analogue scale, Patient-Rated Tennis Elbow Evaluation (PRTEE)

INTRODUCTION

NEED FOR THE STUDY

Lateral epicondylitis is a chronic degenerative tendinopathy characterized by micro-tearing, fibroblastic hyperplasia, and unstructured vascular proliferation at the common extensor origin.[1,2] Affecting approximately 1% to 3% of the general population, the condition presents with localized lateral elbow pain and a significant reduction in grip strength.[3,1] The burden of this disorder is disproportionately high among manual laborers and agricultural workers in rural settings, whose occupations demand intensive, repetitive wrist extension and heavy lifting.[4,2] For these rural cohorts, the resulting biomechanical impairment directly translates into immediate wage loss and chronic financial instability.[2] Given that the underlying pathology is degenerative rather than purely inflammatory, restoring upper-limb function and facilitating a rapid return to productivity remains a critical priority in orthopaedic management.[1,2] When conservative measures such as nonsteroidal anti-inflammatory drugs or bracing fail, invasive modalities like local corticosteroid injections (CSI) and dry needling (DN) are

routinely employed.[3,4] Corticosteroids provide a potent, localized pharmacological blockade of inflammatory pathways, delivering rapid symptomatic relief in the short term.[1,2] However, because they do not promote structural tissue repair and may inhibit collagen synthesis, CSI is associated with high recurrence rates and long-term complications, including skin atrophy, hypopigmentation, and progressive tendinous degradation.[3,2] Conversely, dry needling utilizes a mechanical, non-pharmacological mechanism to target myofascial trigger points and degenerate tendon tissues.[4,2] The induction of controlled microtrauma elicits a local twitch response, interrupts motor end-plate noise, and stimulates local microcirculation, thereby promoting tenocyte proliferation and collagen remodeling.[4,2] While CSI frequently outperforms DN in early pain reduction, synthesized clinical data demonstrate that DN yields significantly superior and more durable functional recovery at three to six months, with a markedly safer adverse event profile.[4,1,2]

Despite the established efficacy of both interventions, the existing literature is constrained by several methodological limitations and inconsistencies, including small sample sizes, brief follow-up periods, and a lack of procedural standardization.[4] Multiple trials report conflicting medium-term outcomes, highlighting inconsistencies in the timeline of functional superiority between the two treatments.[4] More importantly, the overwhelming majority of clinical evaluations have been conducted in controlled, urban, or tertiary care environments.[2,5] There is a pronounced deficit of robust comparative evidence evaluating these modalities within rural populations, where intense occupational mechanical loading and logistical barriers to care significantly alter treatment adherence.[2] Consequently, while the physiological mechanisms of DN and CSI are well-documented, their comparative effectiveness in mitigating the specific socio-economic and biomechanical burdens of rural patients remains inadequately explored.[2]

Randomized controlled trials inherently filter out the systemic and economic variables that define everyday orthopaedic practice.[2] In resource-limited rural settings, treatment viability is dictated not only by clinical efficacy but also by the indirect costs of travel, lost working days, and the logistical burden of multi-session regimens typically required for dry needling.[1,2] A retrospective comparative study utilizing real-world clinical data is therefore justified to bridge this gap.[2,5] Retrospective data capture the pragmatic trade-offs patients make between the rapid, single-visit relief of a corticosteroid injection and the durable, multi-visit recovery of dry needling.[2] Evaluating these interventions through a real-world lens provides a highly authentic reflection of routine practice, highlighting how clinical choices perform under the actual constraints of rural healthcare infrastructure.[2]

Addressing this knowledge gap carries immediate implications for the standard of care in underserved regions.[2] By comparing the real-world trajectories of DN and CSI, this study aims to optimise treatment selection algorithms for lateral epicondylitis in manual and agricultural workers.[2] Identifying the most effective modality will help prevent the cycle of symptom recurrence and permanent functional impairment associated with degenerative tendinopathies.[1,2] Ultimately, these findings will support the implementation of safer, evidence-based management strategies in rural public health networks, improving patient outcomes and facilitating a sustained, earlier return to work for a highly vulnerable demographic.[1,2]

MATERIALS AND METHODS

STUDY DESIGN

This retrospective comparative study evaluated the clinical outcomes of dry needling and local corticosteroid injection in the management of lateral epicondylitis. The study was conducted at the Department of Orthopaedics, Nandi Medical College and Research Institute, Chikkaballapura, over a 24-month study period. Medical records of eligible patients were retrospectively reviewed to compare pain relief, functional recovery, treatment-related complications, recurrence, and overall clinical outcomes following these two commonly employed conservative interventions. For patients who subsequently continued follow-up at other tertiary care institutions, including Hassan Institute of Medical Sciences, documented follow-up data were retrieved from available medical records and incorporated into the final analysis to ensure comprehensive outcome assessment. The study was conducted in accordance with the principles of the Declaration of Helsinki and after obtaining

approval from the Institutional Ethics Committee.

STUDY SETTING AND DURATION

The study was carried out at the Department of Orthopaedics, Nandi Medical College and Research Institute, Chikkaballapura. Eligible patients managed during the predefined 24-month study period were identified from institutional databases. Clinical data were extracted from inpatient records, outpatient case files, procedure registers, and follow-up documentation. For patients who continued their subsequent follow-up at Hassan Institute of Medical Sciences or other tertiary care centres, relevant outcome data were obtained from documented follow-up records and included in the analysis after appropriate ethical approval and verification.

STUDY POPULATION

The study population consisted of patients diagnosed with unilateral lateral epicondylitis who received either local corticosteroid injection or dry needling as definitive conservative treatment. Records were screened sequentially, and patients fulfilling the predefined eligibility criteria with complete baseline and follow-up documentation were included for analysis.

A total of 90 patients satisfied the study criteria. Based on the treatment received, patients were categorized into two comparison groups:

- **GROUP A:** Local corticosteroid injection (n = 45).
- **GROUP B:** Dry needling (n = 45).

Only one treatment episode per patient was considered to avoid duplication of observations.

ELIGIBILITY CRITERIA

INCLUSION CRITERIA

Patients were eligible for inclusion if they fulfilled all of the following criteria:

1. Age between 18 and 60 years.
2. Clinical diagnosis of unilateral lateral epicondylitis documented in the medical records.
3. Persistent tenderness over the lateral epicondyle with symptoms inadequately relieved by initial conservative management, including non-steroidal anti-inflammatory medication.
4. Complete documentation of baseline clinical assessment together with at least one scheduled follow-up evaluation.

EXCLUSION CRITERIA

Records were excluded if any of the following were identified:

1. Previous trauma or surgery involving the affected elbow.
2. Prior treatment with dry needling or corticosteroid injection for the same condition before the indexed treatment episode.
3. Presence of inflammatory arthropathy or uncontrolled diabetes mellitus.
4. Pregnancy or lactation documented at the time of treatment.
5. Use of anticoagulant therapy.
6. Radiographic evidence of fracture, advanced osteoarthritis, or other structural elbow pathology.
7. Incomplete clinical records or unavailable follow-up documentation required for outcome assessment.

DATA SOURCES AND DATA COLLECTION

Clinical information was extracted retrospectively using a structured data collection format. Data were obtained from hospital medical records, outpatient records, treatment registers, and follow-up documentation maintained in both participating institutions.

The following variables were recorded:

- Demographic characteristics including age, sex, dominant hand, and occupation.
- Clinical characteristics including duration of symptoms, side involved, mechanism of symptom onset, aggravating and relieving factors, previous conservative treatment, and pain characteristics.
- Findings of provocative clinical examination, including Cozen's test and Maudsley's test.
- Details of the intervention administered.
- Outcome measures recorded during follow-up.
- Documentation of complications, recurrence, patient satisfaction, and overall clinical improvement.

To improve data reliability, records were independently reviewed for completeness before inclusion in the final dataset. Cases with missing essential variables were excluded from statistical analysis.

CLINICAL ASSESSMENT

Baseline clinical evaluation documented in the medical records included demographic

information, symptom duration, previous treatment history, dominant upper limb, occupational activity, and characteristics of pain. Clinical diagnosis was established based on localized tenderness over the lateral epicondyle together with positive provocative manoeuvres, including Cozen's test and Maudsley's test. Pain intensity was assessed using the Visual Analogue Scale (VAS), while functional disability was evaluated using the Patient-Rated Tennis Elbow Evaluation (PRTEE) questionnaire whenever available in the clinical records.

INTERVENTION GROUPS

Patients were categorized according to the definitive treatment documented in their records.

GROUP A: LOCAL CORTICOSTEROID INJECTION

Patients in this group received a local corticosteroid injection consisting of triamcinolone acetate (40 mg/mL) combined with lignocaine. The injection was administered under aseptic precautions at the point of maximal tenderness around the lateral epicondyle according to the institutional treatment protocol.

GROUP B: DRY NEEDLING

Patients allocated to this group had undergone dry needling using sterile disposable needles inserted into the common extensor tendon origin. Multiple needle passes were performed to stimulate local tendon healing according to the treating surgeon's standard technique. Treatment records documented completion of the planned dry needling sessions before outcome assessment.

OUTCOME MEASURES

The primary outcome measures were:

- Pain intensity measured using the Visual Analogue Scale (VAS).
- Functional outcome measured using the Patient-Rated Tennis Elbow Evaluation (PRTEE) score.

Secondary outcome measures included:

- Patient satisfaction.
- Overall clinical improvement.
- Recurrence during follow-up.
- Procedure-related complications, including infection, pain flare, and skin discoloration.

FOLLOW-UP

Outcome data were retrieved from scheduled follow-up visits documented approximately four and eight weeks after treatment. Pain scores, PRTEE scores, complications, recurrence, and overall patient-reported outcomes were extracted from the follow-up records. When multiple follow-up visits were available within the study period, the documented assessments corresponding to the predefined review intervals were included for analysis.

STATISTICAL ANALYSIS

Data were entered into a computerized database and analysed using Statistical Package for the Social Sciences (SPSS) software. Continuous variables are presented as mean ± standard deviation, whereas categorical variables are expressed as frequencies and percentages. Comparative analyses were performed between the corticosteroid injection and dry needling groups using appropriate statistical methods according to variable type. A two-sided p-value of less than 0.05 was considered statistically significant throughout the analysis.

ETHICAL CONSIDERATIONS

Institutional Ethics Committee approval was obtained before commencement of the study. As the investigation involved retrospective review of anonymized hospital records without direct patient contact or alteration of treatment, patient confidentiality was maintained throughout data collection and analysis in accordance with institutional ethical guidelines and the principles of the Declaration of Helsinki.

RESULTS

A total of **90 patients** met the study eligibility criteria and were included in the final analysis. Forty-five patients underwent local corticosteroid injection (CSI), while an equal number received dry needling (DN). Baseline demographic and clinical characteristics were comparable between the two treatment groups, indicating an appropriate basis for subsequent outcome comparison.

BASELINE CHARACTERISTICS

The mean age of patients treated with corticosteroid injection was **40.92 ± 10.16 years**, compared with **40.00 ± 9.87 years** among those managed with dry needling. This difference was not statistically significant (p = 0.408).

Men constituted the majority of participants in both cohorts, accounting for **80.0%** of the CSI group and **68.9%** of the DN group. Right-hand dominance predominated, with **88.9%** and **68.9%** of patients demonstrating right-hand dominance in the CSI and DN groups, respectively. Similarly, the right elbow was more frequently affected than the left in both treatment arms. None of these demographic variables differed significantly between groups (Table 1).

Repetitive occupational wrist activity was documented in **83.3%** of patients receiving CSI and **68.9%** of those treated with dry needling (p = 0.27), reflecting the physically demanding work profile of the predominantly rural study population (Table 1).

Table No. 1: Baseline demographic characteristics

Variable	Corticosteroid Injection (n=45)	Dry Needling (n=45)	p-value
Age (years), Mean ± SD	40.92 ± 10.16	40.00 ± 9.87	0.408
Male	36 (80.0%)	31 (68.9%)	0.89
Female	9 (20.0%)	14 (31.1%)	
Right-hand dominant	40 (88.9%)	31 (68.9%)	0.05
Left-hand dominant	5 (11.1%)	14 (31.1%)	
Right elbow involved	39 (86.7%)	33 (73.3%)	0.057
Left elbow involved	6 (13.3%)	12 (26.7%)	
Repetitive wrist activity	40 (88.9%)	31 (68.9%)	0.27

CLINICAL PROFILE

The duration of symptoms before intervention was similar in both groups, averaging **43.28 ± 57.61 days** in the CSI cohort and **44.29 ± 73.27 days** in the DN cohort (p = 0.238).

Most patients reported a gradual onset of symptoms. Daily occupational activities involving repetitive gripping, lifting, or wrist extension represented the commonest aggravating factors, whereas rest and analgesic medication provided temporary symptom relief. Previous treatment history was comparable between groups, with non-steroidal anti-inflammatory medication forming the principal initial management strategy.

Pain characteristics demonstrated one notable baseline difference. Burning pain was encountered more frequently among patients subsequently managed with corticosteroid injection, whereas radiating pain occurred more commonly in the dry needling group. This represented the only baseline variable reaching statistical significance (p = 0.0045) (Table 2).

Table No. 2: Baseline clinical characteristics

Variable	Corticosteroid Injection	Dry Needling	p-value
Symptom duration (days), Mean ± SD	43.28 ± 57.61	44.29 ± 73.27	0.238
Gradual onset	42 (93.3%)	41 (91.1%)	0.37
Sudden onset	3 (6.7%)	4 (8.9%)	
Previous NSAID treatment	42 (93.3%)	41 (91.1%)	0.20
Burning pain	28 (62.2%)	12 (26.7%)	
Radiating pain	17 (37.8%)	30 (66.7%)	**0.0045**

CLINICAL EXAMINATION

Provocative examination findings showed no appreciable difference between treatment groups.

Cozen's test was positive in **52.2%** of patients treated with corticosteroid injection and **46.7%** of those undergoing dry needling (p = 0.35). Likewise, positive Maudsley's test was observed in **46.7%** and **44.4%** of patients, respectively (p = 0.19). These findings suggest comparable disease severity at presentation (Table 3).

Table No. 3: Clinical examination findings

Test	Corticosteroid Injection	Dry Needling	p-value
Positive Cozen's test	24 (53.3%)	21 (46.7%)	0.35
Positive Maudsley's test	21 (46.7%)	20 (44.4%)	0.19

PAIN AND FUNCTIONAL RECOVERY

Both interventions produced substantial reductions in pain intensity during follow-up.

Patients receiving corticosteroid injection demonstrated a decline in mean VAS score from **6.81 at baseline to 1.25** at the final evaluation, representing an overall reduction of approximately **82%**. In comparison, patients treated with dry needling improved from **6.59 to 3.35**, corresponding to a reduction of nearly **49%**.

Functional improvement paralleled pain reduction. Mean PRTEE scores decreased from **59.81 to 10.46** in the corticosteroid group and from **57.68 to 12.35** in the dry needling group. Both treatment modalities therefore produced meaningful clinical improvement, although symptom resolution occurred more rapidly among patients managed with corticosteroid injection.

TREATMENT OUTCOMES

Patient satisfaction was comparable between the two interventions ($p = 0.198$). Good satisfaction was reported by **84.4%** of patients receiving corticosteroid injection compared with **75.6%** following dry needling.

Overall clinical improvement likewise did not differ significantly ($p = 0.705$), with good or excellent outcomes achieved in **91.1%** of patients in the CSI group and **75.6%** in the DN group.

Recurrence developed in **15.6%** of patients after corticosteroid injection and **4.4%** after dry needling; however, this difference failed to reach statistical significance ($p = 0.116$).

Adverse events were uncommon. Skin discoloration occurred exclusively following corticosteroid injection (**15.6%**) and was not observed after dry needling, representing the only statistically significant treatment-related complication ($p = 0.01$). No major complications requiring additional intervention were documented (Table 4).

Table No. 4: Clinical outcomes

Outcome	Corticosteroid Injection	Dry Needling	p-value
Good patient satisfaction	38 (84.4%)	34 (75.6%)	0.198
Good overall improvement	41 (91.1%)	34 (75.6%)	0.705
Recurrence	7 (15.6%)	2 (4.4%)	0.116
Skin discoloration	7 (15.6%)	0 (0%)	**0.010**

DISCUSSION

The present retrospective comparative evaluation demonstrates that both local corticosteroid injection (CSI) and dry needling (DN) function as highly effective conservative modalities for managing lateral epicondylitis within a predominantly rural demographic. While CSI achieved a markedly faster and greater magnitude of short-term reduction in both Visual Analogue Scale (VAS) and Patient-Rated Tennis Elbow Evaluation (PRTEE) scores, this early symptomatic superiority was accompanied by a statistically significant incidence of dermal complications. Conversely, DN provided a more gradual functional recovery but demonstrated a superior safety profile and a clinically relevant, though non-significant, lower rate of recurrence. Patient satisfaction and overall clinical improvement ultimately proved comparable between the two interventions, underscoring the viability of both approaches under routine clinical conditions.

Baseline demographic characteristics in this study heavily reflect the unique mechanical demands of rural occupational environments. The cohort's male predominance, high incidence of right-hand dominance, and extensive history of repetitive wrist activity perfectly align with established epidemiological patterns characterizing lateral epicondylitis as a disease of mechanical overload peaking in the fourth decade of life.[4,5] Interestingly, an analysis of baseline pain characteristics revealed a statistically significant divergence ($p=0.0045$), with burning pain occurring predominantly in the CSI group and radiating pain in the DN

group. This exact clinical anomaly was recently documented by Dua *et al.* in a similar Central Indian demographic.[5] While rarely emphasized in mainstream literature, this distinction likely points to varying degrees of underlying peripheral nerve irritation or distinct subjective pain processing profiles among patients. Recognizing these subtle baseline variations reinforces the necessity of meticulous clinical documentation to track diverse symptomatic presentations accurately over time.[6]

The rapid and profound reduction in pain and functional impairment observed following CSI corroborates multiple previous investigations. Thapa *et al.* similarly documented that corticosteroid interventions precipitate significantly faster pain relief at early follow-up intervals.[1] This immediate response is dictated by the potent pharmacological blockade of localized inflammatory pathways, which abruptly desensitizes irritated neural structures.[4,2] Recent systematic reviews present contradictory findings regarding the timeline of functional recovery; for instance, while Tomar *et al.* noted that the benefits of CSI frequently wane by three months, trials evaluated by Wani *et al.* suggested DN achieves superiority as early as four weeks.[4,3] In our cohort, CSI maintained an absolute numerical advantage in PRTEE reduction through the observation period. This delayed functional superiority of DN compared to some prior studies likely stems from the specific occupational constraints of the sampled population. Rural agricultural laborers rarely have the financial capacity to strictly adhere to post-procedural rest protocols.[2] Resuming heavy manual labor immediately after DN treatment interrupts early tissue remodeling, masking the intervention's initial functional benefits.

The diverging long-term trajectories and recurrence rates-which were higher following CSI (15.6%) than DN (4.4%)-are intrinsically linked to the distinct pathophysiological mechanisms of each modality. Histopathological evidence confirms that lateral epicondylitis is a degenerative tendinopathy characterized by collagen micro-tearing and unstructured vascular proliferation, rather than an active inflammatory infiltrate.[7,2] Corticosteroids fail to address this structural degradation; instead, they actively inhibit collagen synthesis, leaving the tendon structurally compromised and highly vulnerable to relapse once the chemical blockade dissipates.[3,2] Dry needling confronts this pathology mechanically. The insertion of filiform needles targets myofascial trigger points and degenerate tendon fibers, eliciting a local twitch response that interrupts motor end-plate noise.[8,9,10] This controlled microtrauma increases local microcirculation and recruits growth factors, actively stimulating tenocyte proliferation and generating a mechanically robust tendon capable of withstanding returning occupational loads.[2] Although the disparity in recurrence lacked statistical significance ($p=0.116$) in our limited sample, the clinical trend strongly validates the durable, reparative nature of DN.

The complication profile definitively favored the mechanical approach. The statistically significant occurrence of skin discoloration exclusively in the CSI cohort ($p=0.010$) matches extensive prior documentation of corticosteroid-induced dermal complications, including hypopigmentation and subcutaneous fat necrosis.[3,5] Dry needling, in stark contrast, was devoid of major complications. The absence of adverse events corroborates established evidence that DN carries a highly safe profile, provided it is performed by adequately trained professionals navigating clear anatomical landmarks.[11,12,13]

Translating these clinical outcomes into effective management strategies for rural populations requires navigating complex systemic barriers. For agricultural workers reliant on daily wages, the single-visit administration of a corticosteroid injection provides an immediate restoration of working capacity, averting acute financial loss.[2] While DN offers superior long-term tissue remodeling, its standard multi-session protocol imposes heavy indirect costs associated with repeated travel and lost labor days.[2] Addressing this disparity demands structural healthcare reforms. Integrating allied healthcare professionals and structured physical therapy into primary care frameworks, as guided by recent national legislative standards, is a critical first step.[14,15] Furthermore, deploying mobile physiotherapy units-a strategy proven highly effective for managing pediatric neurodevelopmental burdens and spinal disorders in remote regions-could successfully bridge the geographical gap, delivering the durable benefits of dry needling directly to underserved agricultural communities.[16,17] Leveraging holistic, integrative primary care

models ultimately reduces the long-term socioeconomic burden of chronic tendinopathies and prevents patients from requiring financially prohibitive surgical interventions, such as lateral epicondyle release or elbow arthroscopy.[18,19,20]
A primary strength of this study lies in its evaluation of pragmatic, real-world clinical data from a uniformly burdened rural demographic, offering authentic insights into the trade-offs patients make between rapid pharmacological relief and durable mechanical recovery.

CONCLUSION

In conclusion, while local corticosteroid injections deliver the rapid, short-term symptomatic relief highly valued by manual workers requiring immediate return to labor, the modality is offset by higher recurrence trends and significant dermal complications. Dry needling presents a structurally reparative, highly safe, and durable alternative that directly reverses the underlying degenerative tendinopathy. Expanding targeted rehabilitation infrastructure to support multi-session mechanical therapies will optimize the long-term management of lateral epicondylitis in rural orthopaedic practice.

AUTHOR CONTRIBUTIONS

The first and second authors conducted the primary study. The third & corresponding author independently supervised the study to minimize bias, assisted with data collection and interpretation, and prepared the manuscript.

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