Ultrasound-guided injection versus landmark-guided injection using corticosteroids for the treatment of lateral epicondylitis

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Purpose
To compare the clinical results of corticosteroid injection using landmark-guided injection (LMGI) and ultrasound-guided injection (USGI) techniques.
Patients and methods
We injected corticosteroids in 55 patients with extraarticular tennis elbow using LMGI and USGI techniques. All patients suffered from lateral elbow pain for more than 3 months with a tender point on the lateral epicondyle. This pain was exaggerated by wrist extension and specific physical activity. For postprocedural evaluation, in a randomized controlled assessor-blinded clinical trial, visual analog score (VAS), pain-free grip strength (PFGS), and the Nirschl staging system were assessed at 1, 6, 24 weeks, and 12 months.
Results
Only 48 participants were included in the final analysis (seven were excluded). Preoperatively, the average VAS scores, tenderness over lateral epicondyle, PFGS values, and Nirschl stages were almost the same (P=0.620, 0.505, 0.784, and 0.455). After 1 week of injection, there was no significant difference noticed in the VAS for pain at rest, tenderness during palpation, the PFGS and Nirschl stages between group 1 and group 2 (P=0.947, 0.724, 0.484, and 0.677, respectively). A statistically significant difference between the two groups was observed from 6 to 48 weeks. At the final follow-up, group 2 had a statistically significant better outcome when compared to group 1 (P<0.05).
Conclusion
USGI had a better long-term outcome than LMGI in the treatment of lateral epicondylitis.

Keywords:
elbow, lateral epicondylitis, ultrasound

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Introduction

Chronic lateral epicondylitis (LE), popularly known as tennis elbow, is a chronic degenerative disease that affects the common extensors origin of the wrist, mainly the extensor carpi radialis brevis (ECRB) [1].

A 1–3% of the population suffered from tennis elbow between the fourth and fifth decades without sex predisposition [2].

The clinical introduction of LE was presented by Runge in 1873 [3].

Pain is the most common presenting symptom in the lateral part of the humeral epicondyle and may extend along with the long wrist extensors. Additionally, weakness of the hand grip may occur [4].

LE may be extraarticular, intraarticular, or mixed. In the extraarticular subtype, pain is on the lateral humeral epicondyle, aggravated by wrist extensor strain test and relieved by rest. In the intraarticular LE, pain is around the humeral condyle was not relieved by rest [5].

Many different treatment options were reported for LE, including wait-and-see, physiotherapy, corticosteroid injection, autologous blood injection, and surgery (percutaneous, arthroscopic, or open), and even acupuncture and botox infiltrations with different results rates [6–9].

Despite their short-term action, corticosteroids are widely accepted treatment lines as they fasten pain relief and return to daily activity [10,11].

Corticosteroids were traditionally injected using the landmark-guided injection (LMGI) technique, targeting the peritendinous region superficial to the

common extensor tendon. In ultrasound-guided injection (USGI), a needle was positioned in an abnormal common extensor tendon [12].

The present study was intended to compare the clinical results of corticosteroid injection using USGI and LMGI methods.

We hypothesized that USGI has better outcomes than LMGI regarding pain, return to physical activity, and recurrence rate.

Patients and Methods

After ethical committee approval, this prospective study was conducted in our institute from March 2021 to April 2022. All eligible patients (signed procedural consent) suffered from lateral elbow pain for over 3 months with a specific tender point on the lateral epicondyle. This pain was exaggerated by wrist extension and specific physical activity [5]. The age of participants was above 18 and below 60 years. All candidates had extraarticular LE. Any patient with bilateral elbow affection, history of previous elbow injury or surgery, coexisting neck or chest pathology, malignancy, infection, ganglion, or arthritis in the elbow was excluded from the study. During the postinjection phase, any patient who suffered a new elbow trauma, excessive usage of analgesics, or noncompliance with the follow-up schedule was not included in the final analysis.

The investigator (who did the procedures) explained the procedures' steps and the study's aims to all participating patients.

A randomized, controlled, assessor-blinded clinical trial uses visual analog score (VAS), grip strength, and the Nirschl staging system for postprocedural evaluation at 1, 6, 24 weeks, and 12 months.

Sample size

We calculated sample size using the G*Power 3.1.9.2 software. We conducted an a priori test to achieve a statistical power (1–β) of 90%, where alpha is 0.05. Forty patients had to be included in our study. Our target was to include 55 candidates to compensate for the dropout during the study course.

Statistical analysis

The Excel software (Microsoft Corporation, Washington, USA) tabulated the study data. For data analysis, we used the SPSS, version 24.0 (IBM Corporation, Armonk, New York, USA). The quantitative data were presented as mean±SD, whereas the qualitative data was presented as frequencies with percentages. The independent *t* test detected the differences in normally distributed numerical values. In contrast, we used the Mann–Whitney *U* test to find the differences in nonnormally distributed numerical values. Statistical significance was set at a *P* value of less than 0.05.

Procedural details

In LMGI (group 2), the patient sat upright with the elbow in extension, the forearm in pronation, and a soft pillow under the elbow. The lateral aspect of the elbow was sterilized by alcohol 70%. We used a mixture of 40 mg methylprednisolone and 2 ml of lidocaine 2% in the same syringe. This mixture was injected through a 22-gauge needle inserted perpendicular in the epicondyle center (if the patient had enough subcutaneous fat or 45° if there was not enough fat). We observed our patients for 15 min before discharge.

In USGI (group 1), all the steps were the same except the needle placement technique. US transducer (Samsung PT60A model, Probe LN5-12) was placed parallel to the common extensor tendons, and the needle was placed parallel and below the transducer and advanced from distal to proximal until the center of the common extensor tendon origin.

All patients took one injection and were encouraged for early full elbow movement.

Results

We recruited 55 patients for this study. Only 48 patients were included in the final statistic. We excluded seven patients (two cases changed their minds during the follow-up stage, three were excluded because they were not compliant during the follow-up period, and two cases of patients used analgesics regularly during the follow-up period (Table 1).

Preoperatively, the average of VAS scores, the level of tenderness over lateral epicondyle, the pain-free grip strength (PFGS) values, and Nirschl stages were almost the same (*P*=0.620, 0.505, 0.784, and 0.455) (Tables 2–5 and Figs 1–4).

After 1 week of injection, there was no significant difference noticed in the VAS for pain at rest, tenderness during palpation, the PFGS and Nirschl stages between group 1 and group 2 (*P*=0.947, 0.724, 0.484, and 0.677, respectively).

A statistically significant difference between the two groups was observed from 6 to 48 weeks. The mean VAS scores and mean Nirschl stages of both groups were reduced.

Table 1 Demographic criteria of groups 1 and 2

	Group 1 (25)	Group 2 (23)	*P* value
Age	37.08 (22–56)	41.9 (21–57)	0.124
Duration of symptoms	5.8800 (3–10)	6.4348 (3–10)	0.350
Sex (male/female)	15/10	13/10	0.519
Laterality (right/left)	15/10	13/10	0.519
Employment			
Manual	16	14	0.529
Nonmanual	9	9	

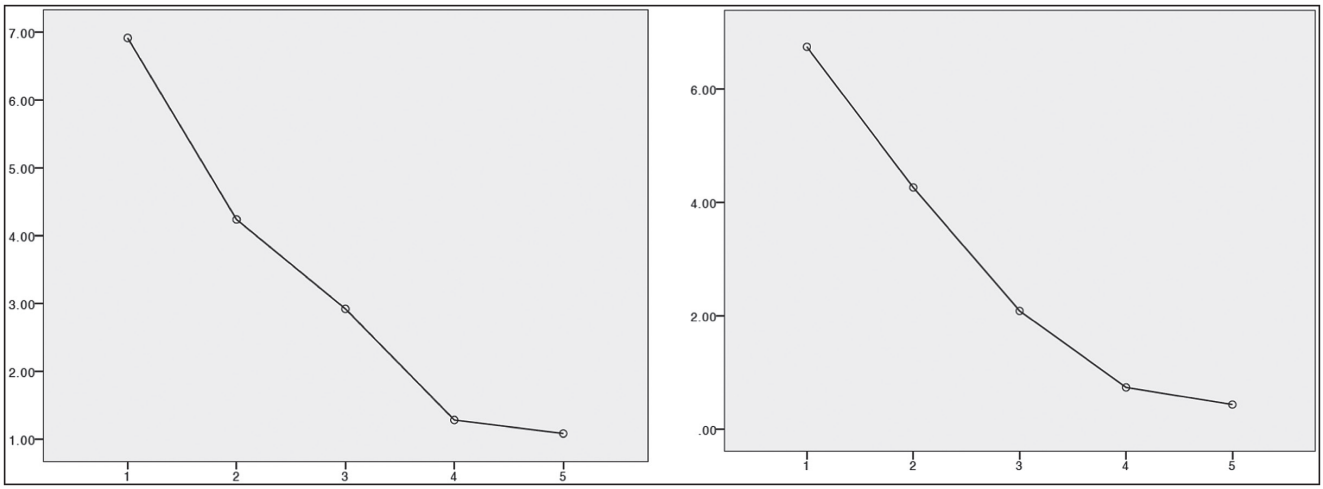
Table 2 Mean visual analog scale score for pain at rest for group 1 and group 2

Follow up	Visual analog score (mean±SD)		*F*	*P* value
	Group 1	Group 2		
Pre	6.9200 ± 1.28841	6.7391 ± 1.21421	0.249	0.620
1 week	4.2400 ± 1.05198	4.2609 ± 1.09617	0.005	0.947
6 weeks	2.9200 ± 0.70238	2.0870 ± 0.84816	13.822	0.001
24 weeks	1.2800 ± 0.45826	0.7391 ± 0.54082	14.048	0.000
48 weeks	1.0800 ± 0.40000	0.4348 ± 0.50687	24.167	0.000

Table 3 Mean values of assessment of tenderness during palpation for group 1 and group 2

Follow up	Mean (SD) tenderness (mean±SD)		*F*	*P* value
	Group 1	Group 2		
Pre	1.1800 ± 0.49749	1.2826 ± 0.56056	0.451	0.505
1 week	1.9200 ± 0.75939	2.0000 ± 0.79772	0.127	0.724
6 weeks	3.2400 ± 0.77889	3.1739 ± 0.83406	0.081	0.778
24 weeks	3.9200 ± 0.75939	4.3478 ± 0.83168	3.471	0.069
48 weeks	4.4000 ± 0.86603	5.3913 ± 0.49901	23.064	0.000

Figure 1:



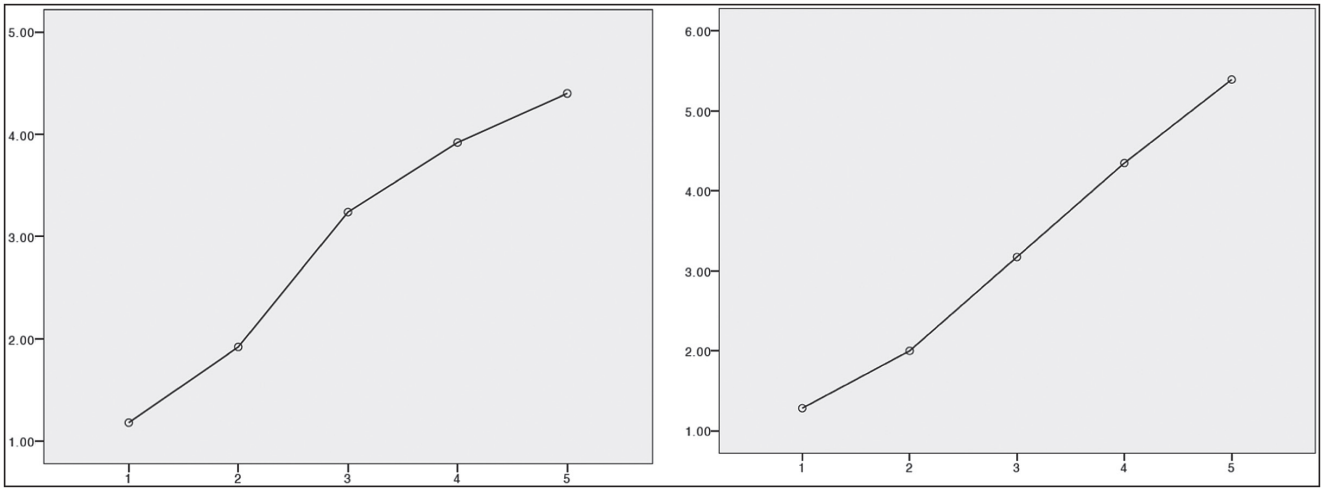
Changes in visual analog score (VAS) in group 1 (left) and group 2 (right) during the follow up phases.

Over time, group 1 descended significantly compared to group 2 (P<0.05).

The mean values of tenderness during palpation and the PFGS of both groups increased, while dramatic increment was noticed in group 1 with increasing length of follow-up (P<0.05).

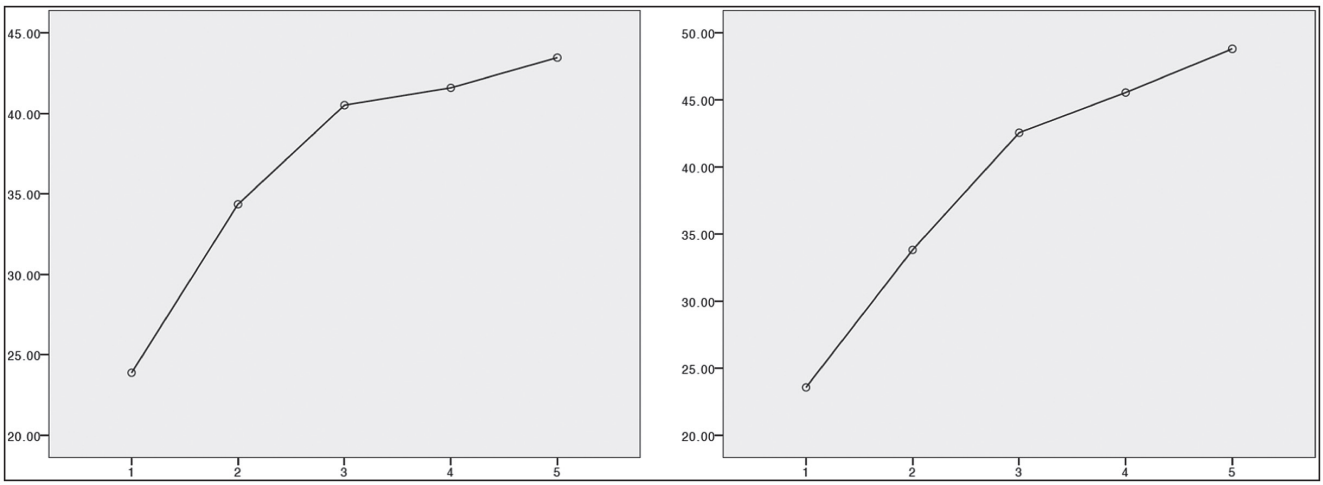
Two patients presented with local skin hypopigmentation in group 2, while no patient in group 1 exhibited this problem, but this complication was without statistical significance (P=0.154). We did not record any other complication in either group (joint stiffness, infection, reflex sympathetic dystrophy, and tendon rupture).

Figure 2:



Changes in tenderness in group 1 (left) and group 2 (right) during the follow up phases.

Figure 3:



Changes in pain-free grip strength (PFGS) in group 1 (left) and group 2 (right) during the follow up phases.

Discussion

This study showed that both groups (USGI, LMGI) had the same results after 1 week of the procedure without statistically significant difference. However, the USGI group had a better outcome than LMGI with statistically significant differences at 6, 24, and 48 weeks of follow-up.

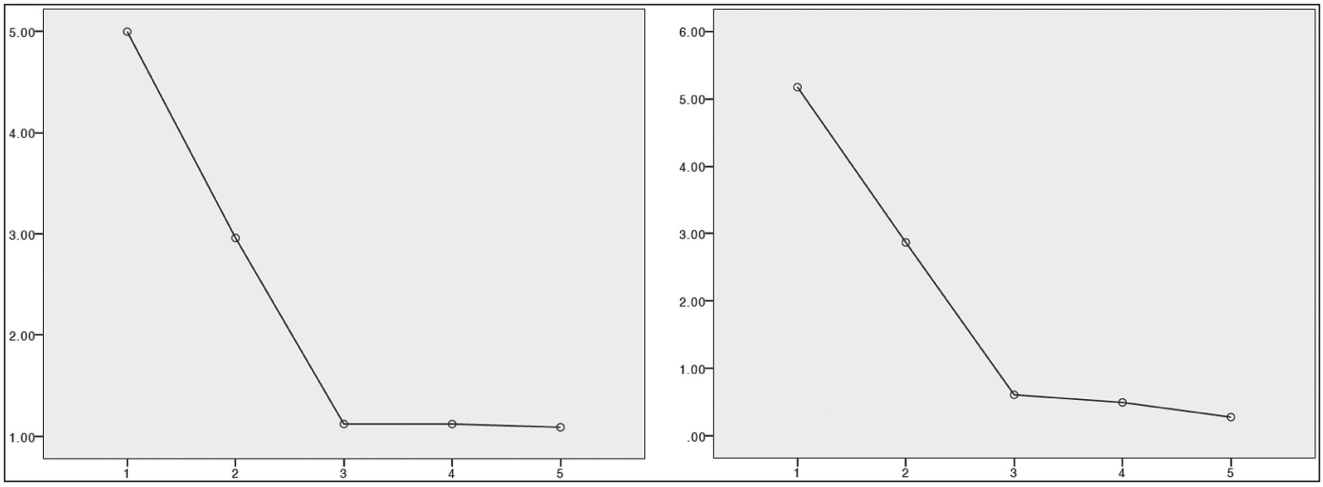
Despite LE being self-cured within 1 year without intervention [13], most patients, mainly (sports players and manual workers), cannot tolerate it for this extended period.

The pathophysiology of tennis elbow is unclear. There are microtears in the common extensor origin (mainly ECRB) and progressive degeneration with inappropriate healing [14]. Microscopical examination detects a bizarre collagen fiber orientation, neovascularization, mucoid degeneration, fibroplasia, and dystrophic calcification, mainly in ECRB [15].

Most local injections around the elbow joint were done using a landmark as guidance.

Recently, physicians have preferred high-definition ultrasonography for guided injection around the elbow as it detects structural changes affecting tendons (thickening, thinning, intrasubstance degenerative areas, and tendon tears, for example), bone irregularities, or calcific deposits. Neovascularization can also be assessed by color Doppler exploration. The absence of this finding, or no changes in greyscale US, can be useful to rule out LE [16]. Also, the injection was delivered to the affected tendon precisely.

Figure 4:



Changes in Nirschl staging system in group 1 (left) and group 2 (right) during the follow-up phases.

Table 4 Mean pain-free grip strength values for group 1 and group 2

Follow up	Pain-free grip strength (kg) (mean±SD)		*F*	*P* value
	Group 1	Group 2		
Pre	23.8800 ± 3.92980	23.5652 ± 3.97522	0.076	0.784
1 week	34.3600 ± 2.38656	33.8261 ± 2.38656	0.499	0.484
6 weeks	40.5200 ± 1.38804	42.5652 ± 0.78775	38.485	0.000
24 weeks	41.6000 ± 2.75379	45.5652 ± 0.94514	42.965	0.000
48 weeks	43.4800 ± 2.78568	48.8261 ± 1.40299	68.610	0.000

Table 5 Mean Nirschl stage scores for group 1 and group 2

Follow up	Nirschl stage (mean±SD)		*F*	*P* value
	Group 1	Group 2		
Pre	5.0000 ± 0.81650	5.1739 ± 0.77765	0.569	0.455
1 week	2.9600 ± 0.73485	2.8696 ± 0.75705	0.176	0.677
6 weeks	1.1200 ± 0.20000	0.6087 ± 0.14114	103.028	0.000
24 weeks	41.6000 ± 0.20000	0.4957 ± 0.16370	138.621	0.000
48 weeks	1.0880 ± 0.19647	0.2783 ± 0.10426	309.992	0.000

Corticosteroids have a long history of treating LE, especially for short-term effects, because of their anti-inflammatory effect and increasing blood flow through dilating blood vessels [17].

USGI group had significant improvement over 1 year; this may be due to the delivery of medicine in the affected area, so its concentration will be high, opposite to LMGI medicine delivered in paratendinous. Also, the introduction of the needle in USGI may disrupt affected tissue and generate local inflammatory processes like acupotomy.

Some researchers compared acupotomy and corticosteroids using anatomical landmark-guided technique; acupotomy had better long-term effects than corticosteroids, and these results were comparable to our study [5].

In 2022, a study comparing leucocyte enriched platelet-rich plasma, glucocorticoid, and normal saline concluded that leucocyte enriched platelet-rich plasma had better long-term effects than steroids [18]. These findings proved that injection of corticosteroids without ultrasound guidance shortened their effects, consistent with our findings.

We noticed that USGI had severe pain postprocedural compared to LMGI, lasted for 2–3 days, and was managed by NSAID coverage for these days. This pain may be due to the needle centering (USGI) in the affected area and flaring up the inflammatory mediators.

According to the findings of this study, USGI had a better long-term effect than LMGI in the treatment of LE.

Limitations

There were some limitations, although we considered age and sex as confounders; also, males and females have different daily physical activities and would respond differently to injection, an issue that should be investigated thoroughly. We did not take into account the patient's occupation. We had only included participants within a specific age group; as a result, our assumption cannot be applied to patients outside this age group.

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Nil.

Conflicts of interest

There are no conflicts of interest.

References

1 Shiri R, Viikari-Juntura E, Varonen H, Heliövaara M. Prevalence and determinants of lateral and medial epicondylitis: a population study. Am J Epidemiol 2006; 164:1065–1074.

2 Brummel J, Baker CLIII, Hopkins R, Baker CL Jr. Epicondylitis: lateral. Sports Med Arthrosc Rev 2014; 22:e1–e6.

3 Stegink-Jansen CW, Jung B, Somerson JS. Translation of Runge's 1873 publication 'on the etiology and treatment of writer's cramp': the first description of 'tennis elbow'. Clin Anat 2022; 35:316–322.

4 Chourasia AO, Buhr KA, Rabago DP, Kijowski R, Irwin CB, Sesto ME Effect of lateral epicondylosis on grip force development. J Hand Ther 2011; 25(1):27–37.

5 Ge L-P, Liu X-Q, Zhang R-K, Chen Z-N, Cheng F. Comparison between acupotomy and corticosteroid injection for patients diagnosed with different classifications of tennis elbow: a randomized control trial. J Orthop Surg 2022; 17:433.

6 Lee DO, Gong HS, Kim JH, Rhee SH, Lee YH, Baek GH. The relationship between positive or negative phrasing and patients' coping with lateral epicondylitis. J Shoulder Elbow Surg 2014; 23:567–572.

7 Yao G, Chen J, Duan Y, Chen X. Efficacy of extracorporeal shock wave therapy for lateral epicondylitis: a systematic review and meta-analysis. Biomed Res Int 2020; 18:2064781.

8 Lapner P, Alfonso A, Hebert-Davies J, Pollock JW, Marsh J, King G. Nonoperative treatment of lateral epicondylitis: a systematic review and meta-analysis. JSES Int 2021; 6:321–330.

9 Kim GM, Yoo SJ, Choi S, Park YG. Current trends for treating lateral epicondylitis. Clin Shoulder Elb 2019; 22:227–234.

10 Coombes BK, Bisset L, Brooks P, Khan A, Vicenzino B. Effect of corticosteroid injection, physiotherapy, or both on clinical outcomes in patients with unilateral lateral epicondylalgia: a randomized controlled trial. JAMA 2013; 309:461–469.

11 Coombes BK, Bisset L, Vicenzino B. Efficacy and safety of corticosteroid injections and other injections for management of tendinopathy: a systematic review of randomized controlled trials. Lancet 2010; 376:1751–1767.

12 Sussman WI, Williams CJ, Mautner K. Ultrasound-guidedelbow procedures. Phys Med Rehabil Clin N Am 2016; 27:573–587.

13 Johns N, Shridhar V. Lateral epicondylitis: current concepts. Aus J Gen Pract 2020; 49:707–709.

14 Lungu E, Grondin P, Tétreault P, Desmeules F, Cloutier G, Choinière M, Bureau NJ. Ultrasound-guided tendon fenestration versus open-release surgery for the treatment of chronic lateral epicondylosis of the elbow: protocol for a prospective, randomised, single blinded study BMJ Open 2018;8: e021373.

15 Potter HG, Hannafin JA, Morwessel RM. Lateral epicondylitis: correlation of MR imaging, surgical, and histopathologic findings. Radiology 1995; 196:43–46.

16 Vaquero-Picado A, Barco R, Antuña SA Lateralepicondylitis of the elbow. EFORT Open Rev 2016; 1:391–397.

17 Shergill R, Choudur HN. Ultrasound-guided interventions in lateral epicondylitis. J Clin Rheumatol 2019; 25:e27–e34.

18 Arora KK, Kapila R, Kapila S, Patra A, Chaudhary P, Singal A. Management of lateral epicondylitis: a prospective comparative study comparing the local infiltrations of leucocyte enriched platelet-rich plasma (L-aPRP), glucocorticoid and normal saline. Malays Orthop J 2022; 16:58–69.