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# KSES 2026

The 33rd Annual  
International Congress of the  
Korean Shoulder and  
Elbow Society

March  
27(Fri) ~ 28(Sat), 2026  
BEXCO, Busan, Korea

- Abstract No. : F-0151
- Category : Elbow
- Detail Category : trauma , Instability

## Identifying Surgical Candidates After Posterolateral Elbow Dislocation: Structural Predictors on MRI

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### Introduction and Background

Most posterolateral elbow dislocations remain stable after reduction despite MRI evidence of widespread soft-tissue injury. Because complete tears of major ligamentous stabilizers are common regardless of clinical stability, determining which patients require surgical stabilization remains challenging. This study aimed to identify specific MRI patterns that indicate mechanical instability.

### Material and Method

A total of 186 elbows with acute posterolateral elbow dislocation underwent early MRI and were retrospectively reviewed. Soft-tissue injuries were graded as intact, partial, or complete. The unstable group (n = 24, 12.9%) consisted of elbows requiring surgical stabilization due to gross mechanical instability. Associations between structural failures and instability were assessed using univariate, multivariate, and combinational analyses. In addition to single-structure effects, we evaluated a Core-4 model comprising the flexor-pronator mass (F-P), posterior medial collateral ligament (pMCL), common extensor origin (CEO), and posterolateral ligament (PLL), representing the four principal static and dynamic pillars of elbow stability.

### Results

Complete tears of the lateral collateral ligament complex and the anterior MCL were common in both stable and unstable elbows and showed limited discriminative value. Complete CEO tear was uncommon and not independently associated with instability. In contrast, complete F-P tear and displaced complete PLL tear were the strongest and most consistent predictors of instability. Their coexistence predicted instability with 92% sensitivity, 99% specificity, and a positive predictive value of 92%. The Core-4 analysis supported a threshold phenomenon wherein instability arose from the cumulative failure of key stabilizers.

### Conclusions

Although most posterolateral elbow dislocations can be treated nonoperatively, combined complete failure of the F-P and the displaced PLL reliably identifies elbows at high risk of mechanical instability. The Core-4 concept reinforces that instability results from cumulative failure of key medial and posterolateral stabilizers and may guide early selection of patients who would benefit from surgical intervention.



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Figure & Table 1.

**Table 1:** Prevalence of Complete Soft-Tissue Injuries on MRI

Structure (Complete Tear)	Stable Group (n=162)	Unstable Group (n=24)	p-value
<b>Lateral Collateral Ligament Complex (LCLC)</b>	129 (79.3%)	24 (100.0%)	0.01
<b>Anterior Medial Collateral Ligament (aMCL)</b>	91 (56.3%)	15 (62.5%)	0.54
<b>Posterior Medial Collateral Ligament (pMCL)</b>	50 (31.0%)	17 (72.7%)	<0.001
<b>Flexor-Pronator Mass (F-P)</b>	13 (8.0%)	22 (91.7%)	<0.001
<b>Displaced Posterolateral Ligament (PLL)</b>	30 (18.4%)	19 (79.5%)	<0.001
<b>Common Extensor Origin (CEO)</b>	30 (18.4%)	14 (58.3%)	<0.001
<b>Anconeus (Displaced)</b>	43 (26.4%)	18 (75.0%)	<0.001

Figure & Table 2.

Table 2. Diagnostic Performance of MRI Findings Predicting Mechanical Instability

MRI criterion	Sensitivity	Specificity	PPV	NPV
F-P complete tear	0.92	0.83	0.46	0.99
PLL displaced complete tear	0.92	0.82	0.34	0.99
pMCL complete tear	1.00	0.80	0.28	1.00
CEO complete tear	0.61	0.83	0.35	0.94
Anconeus complete tear	0.73	0.71	0.31	0.94
LCLC complete tear	1.00	0.70	0.26	1.00
<b>F-P complete + PLL complete</b>	<b>0.92</b>	<b>0.99</b>	<b>0.92</b>	<b>0.99</b>
Any two complete tears	0.95	0.79	0.32	0.99