

Reverse Perilunate Injuries—The “Extended Scaphoid” Sign

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Abstract

Background Reverse perilunate injuries (REPLI) are rare variants of the classic radial-sided perilunate injuries (PLI) whose mechanism was described by Mayfield in 1980. Classic radial-sided nontranscaphoid dorsal PLI invariably display a flexed, foreshortened position of the scaphoid on their initial posteroanterior (PA) and lateral radiographs. We observed that some dorsal perilunate dislocations displayed an *extended* position of the scaphoid on their initial radiographs. Our hypothesis is that this extended position of the scaphoid was associated with a REPLI pattern.

Methods The PA and lateral initial emergency radiographs of our specialized wrist surgery series of 114 dorsal pure ligamentous PLI (within a 186 cases series of PLI treated between 2004 and 2020) were reviewed as well as the available figures of the current REPLI literature.

Results A total of seven cases of cases within our dorsal PLI series displayed an extended position of the scaphoid on their initial PA and lateral radiographs, while 107 cases displayed a flexed, foreshortened position. The PA and lateral radiographs available in the REPLI literature displayed an extended position of the scaphoid, a lunotriquetral dissociation, and a dorsal dislocation of the capitate with respect to the lunate.

Discussion This study confirms our hypothesis. By contrast to the dorsal classic radial-sided pure ligamentous PLI pattern of scaphoid displacement (scaphoid flexed and foreshortened with scapholunate gap), the dorsal REPLI pattern displays an extended position of the scaphoid with scapholunate step-off and overlap rather than a gap. The combination of a lunotriquetral dissociation with a dorsal dislocation of the capitate from the lunate yet an extended position of the scaphoid with almost normal radioscapoid relationships should raise a high suspicion for REPLI.

Keywords

- ▶ reverse perilunate dislocation
- ▶ wrist
- ▶ carpus
- ▶ perilunate injuries

Reverse perilunate injuries (REPLI) are rare variants of the classic radial-sided perilunate injuries (PLI) whose mechanism was described by Mayfield in 1980.¹ The REPLI pattern of trauma described by Viegas et al² and Murray et al³ begins ulnarly at the lunotriquetral interval and extends to the radial side of the carpus typically including a dorsal sublux-

ation or dislocation of the capitate from the lunate and a scapholunate dissociation with volar lunate dislocation as an end-stage.

Classic radial-sided nontranscaphoid dorsal PLI invariably display a flexed, foreshortened position of the scaphoid on their initial posteroanterior (PA) and lateral radiographs. We

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observed a long time ago that some dorsal perilunate dislocations surprisingly displayed an extended position of the scaphoid on their initial PA and lateral radiographs.

Our hypothesis was that this extended position of the scaphoid was associated with a REPLI pattern. We tested this hypothesis by reviewing our monocentric series of 114 pure ligamentous PLI and comparing these findings with the PA and lateral initial radiographs available in the current literature.

Methods

The PA and lateral initial emergency radiographs of our specialized wrist surgery series of 114 dorsal pure ligamentous PLI (within a 186 cases series of PLI treated between 2004 and 2020) were reviewed as well as the available figures of the current REPLI literature.²⁻⁷

On PA radiographs, the position of the scaphoid was investigated whether it was flexed (and apparently foreshortened with scapholunate gap) or extended (whole scaphoid visible as in an ulnar inclination view and no visible scapholunate gap).

On lateral radiographs, the position of the scaphoid relative to the distal radius was investigated whether it was flexed (with no contact between the proximal scaphoid and the scaphoid facet of the distal radius) or extended (with persistent radioscapoid contact).

Results

A total of seven cases of cases within our dorsal PLI series displayed an extended position of the scaphoid on their initial PA and lateral radiographs, while 107 cases displayed a flexed, foreshortened position. A lunotriquetral dissociation on the PA radiographs was observed in all seven cases. Among our seven cases, five showed a dorsal dislocation of the capitate with respect to the lunate. One case showed a dorsal subluxation of the capitate with respect to the lunate. In one case, the loss of normal relationships between the capitate and lunate was replaced by a fracture of the body of the capitate with dorsal displacement of the distal fragment. Similarly, the PA and lateral radiographs available in the REPLI literature³⁻⁷ displayed an extended position of the scaphoid, a lunotriquetral dissociation, and a dorsal dislocation of the capitate with respect to the lunate.

Both in the REPLI literature³⁻⁷ and in our series with dorsal REPLI suspicion, the PA views of the scapholunate junction displayed a step-off and overlap rather than a gap.

Discussion

PLI are midcarpal dissociative injuries consisting of a traumatic interruption of the integrity of the proximal carpal row on both sides of the lunate.^{8,9} They include an unlimited spectrum of pathology depending on the path of trauma to the proximal carpal row (best analyzed on PA X-rays) and the direction/amount of displacement of the capitate with respect to the lunate (best analyzed on lateral X-rays). It has recently been shown that nondislocated PLI are equivalents of perilunate

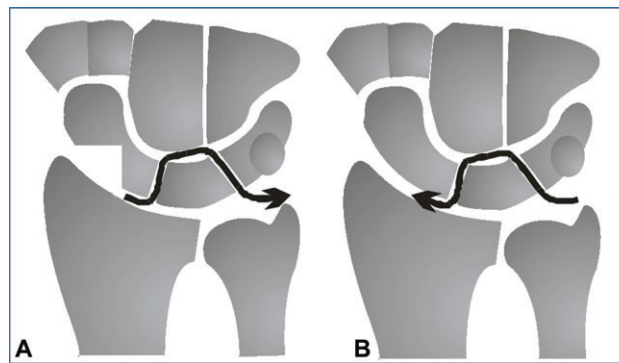


Fig. 1 (A) Classic path of lesser arc perilunate injury. (B) Reverse path of lesser arc perilunate injury.

dislocations and should be included into the PLI spectrum.^{8,10} PLI may be associated with distal radial ulnar joint dislocations or axial carpal dislocations in unlimited combinations.

According to Mayfield who experimentally described four progressive stages, most dorsal PLI initiate at the radial side of the wrist as a consequence of wrist hyperextension, ulnar deviation, axial load, and intracarpal supination.^{1,8} The spectrum of typical radial-sided PLI extend from scapholunate dissociation to lunotriquetral dissociation (►Fig. 1A) with dorsal capitulum dislocation, while the lunate may or may not be dislocated volarly from the radius.

Viegas^{2,8} was the first author to experimentally reproduce this sequential mechanism (3 stages) beginning with a high energy fall on the hypothenar eminence (►Fig. 1B). Chin⁴ was the first author to mention the term “reverse perilunate” in the title of a clinical paper. His case report described a combination of REPLI and axial radial carpal dislocation. Very little has been written about REPLI and the largest clinical series includes six cases. On the lateral emergency X-rays, the dorsal dislocation/subluxation of the capitate with respect to the lunate is generally obvious both in radial-sided PLI and REPLI.

In a classic radial-sided dorsal PLI with dislocation, the flexed position scaphoid that was visible on the PA views is confirmed with the proximal pole of the scaphoid no longer in contact with the distal radius (►Fig. 2A, B).

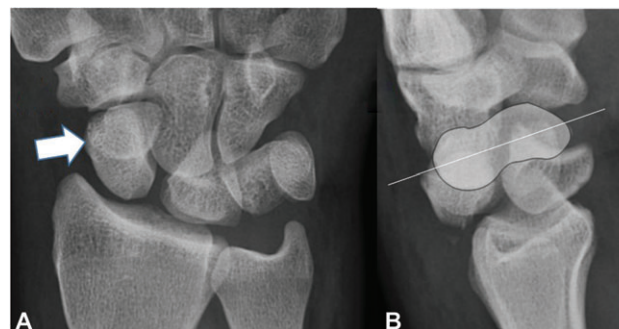


Fig. 2 Classic radial-sided perilunate dislocation. (A) Posteroanterior view: The scaphoid (white arrow) is foreshortened; there is a scapholunate gap and a lunotriquetral step-off. (B) Lateral view: The scaphoid (long axis as a white line) is almost perpendicular to the distal radius with complete loss of contact with the scaphoid facet of the radius.

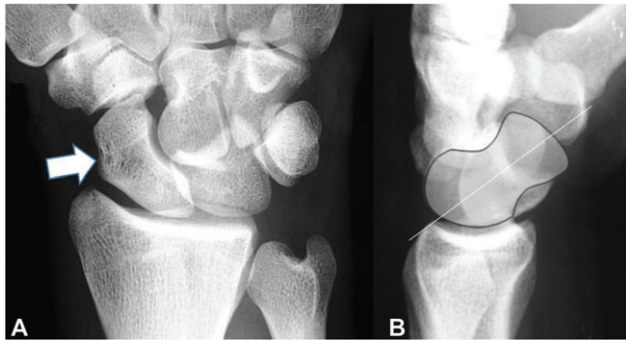


Fig. 3 Reverse perilunate injury: (A) Posteroanterior view: There is an “extended scaphoid,” (white arrow) no scapholunate gap, a double contour of the scapholunate interval, and a lunotriquetral gap and step-off. (B) Lateral view: Despite the obvious dorsal dislocation of the capitate, the “extended scaphoid” has remained in an almost normal inclination (long scaphoid axis as a white line) and relationship with the radius.

By contrast, in an ulnar-sided dorsal REPLI with dislocation, the proximal scaphoid has kept its relationships with the distal radius (► **Fig. 3A, B**). The preservation of the extended position of the scaphoid that one may observe in a REPLI is characteristic. This explains why despite loss of Gilula’s arcs I and II, there is no carpal shortening in REPLI.

On PA radiographs, the dorsal REPLI pattern displays an extended position of the scaphoid with scapholunate step-off and overlap rather than a gap. The combination of a lunotriquetral dissociation with a dorsal dislocation/subluxation of the capitate from the lunate (or an equivalent fracture of the body of the capitate) yet an extended position of the scaphoid with almost normal radioscapoid relationships should raise a high suspicion for REPLI.

Between 2004 and 2020, we have identified only seven REPLI (4%). This is an exceedingly rare variant of PLI. The

“extended scaphoid” sign should help recognizing this entity in the future. Because the involvement of the scapholunate interval represents only the end-stage of a REPLI, the prognosis of a REPLI may be better than the prognosis of classic PLI if the scapholunate intrinsic and extrinsic ligaments have a mild-to-moderate involvement. This has to be proven by future studies.

Conflict of Interest
None declared.

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