The Clinical Implications of Scaphotrapezium-Trapezoidal Arthritis With Associated Carpal Instability

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Purpose: Common causes of dorsal intercalated segment instability (DISI) include scapholunate dissociations and scaphoid fracture nonunions. Although less common than these, scaphotrapezium-trapezoidal (STT) osteoarthritis (OA) may also be associated with the development of a DISI deformity. The clinical implications of this form of carpal instability in cases of STT arthritis are still unknown. To study the radiographic progression and incidence of this entity, we reviewed our patients and report on 24 wrists with DISI in the presence of STT arthritis.

Methods: A retrospective chart and radiographic review was performed on all patients seen between 1994 and 2004, with the diagnosis of STT arthritis to identify a subgroup of patients with DISI deformity on the presenting radiographs. Patients' clinical and surgical courses were noted. Postoperative radiographic changes were recorded, as were clinical outcomes.

Results: Sixteen patients with 24 wrists having STT arthritis and DISI deformity on presenting radiographs were identified. The median STT arthritis grade was 3.0 based on a modified Eaton and Glickel grading system. The median radiolunate angle was −21° of dorsal tilt. All patients had normal scapholunate angles. Abnormal scaphoid extension was seen in 19 of 24 wrists as measured by the radioscaphoid angle. Concomitant carpometacarpal arthritis was seen in 67% (n = 16) of the wrists, and midcarpal arthritis was identified in 50% (n = 8) of patients. Fifteen wrists required surgery for the symptoms and were followed up for a mean of 29 months after surgery. In the surgical group the radiolunate angles increased by mean of 6° after surgery. Four of the 15 wrists required revisional surgery for persistent pain.

Conclusions: Patients with STT arthritis may present with carpal instability that is not related to radiographic scapholunate instability. This instability is characterized by a normal scapholunate angle with an extension stance of the scaphoid and lunate. Midcarpal arthritis may be present. Surgical intervention for patients with STT arthritis and DISI deformity may lead to radiographic progression of midcarpal instability. (J Hand Surg 2007;32A:47–54.

Key words: Scaphotrapezium-trapezoidal, carpal instability, arthritis, DISI.

Well-known causes of dorsal intercalated segment instability (DISI) include scapholunate (SL) dissociation and scaphoid fracture nonunion. Although less common, scaphotrapezium-trapezoidal (STT) osteoarthritis (OA) has also been reported to be associated with radiographic DISI deformity.[1] Recent anecdotal reports have suggested that a nondissociative form of DISI may exist in association with STT arthritis.[2,3] It has been suggested that arthritic erosion of the STT joint serves to loosen the constraints of the STT articulation, resulting in carpal instability in the absence of a true disruption of either the SL or lunotriquetral ligaments. Another postulate implicated diminished scaphoid length in STT arthritis as causing a decreased scaphoid force couple and eventual scaphoid extension and DISI deformity.[4] This form of instability, in which lunate-capitate malalignment is present in the absence of SL and lunotriquetral injury, has been referred to as *carpal instability nondissociative* (CIND).[1,5,6]

The purpose of our work was to examine the radiographic carpal angles in patients with isolated STT arthritis and DISI deformity to further understand its etiology.

Materials and Methods

After obtaining institutional review board approval, a retrospective chart and radiographic review was performed. The records of all patients with the clinical diagnosis of STT arthritis seen between the years 1994 and 2004 were examined. Patients were included in the study if they presented with evidence of a DISI deformity on the presenting radiographs in the absence of scaphoid nonunion or SL diastasis. Patient records were reviewed for demographic data, surgical intervention, and any postoperative interventions.

Radiographic reviews involved the staging of OA in the STT joint, midcarpal (capitolunate [CL]) joint, and trapeziometacarpal (TM) joint. A modification of the Eaton and Glickel staging system was used for the radiographic staging of OA (Table 1). The carpal angles measured on true lateral wrist radiographs included the radiolunate (RL), CL, SL, and radioscaphoid angles. We limited our measurements to wrist lateral radiographs that had a radius–third metacarpal angle of less than 20° from neutral to reduce the likelihood of a pseudo-DISI deformity, which is apparent extension of the lunate because of excessive wrist extension during radiographic examination. We also limited our measurements to wrist lateral radiographs that showed adequate distal radioulnar overlap or scaphopisocapitate relationships.[8] A summary of the radiographic parameters measured and the normal ranges used for comparison are shown in Table 2. Measurements of all carpal radiographic angles were performed with the tangential method, because it has the highest interobserver and intraobserver reliabilities when the third metacarpal axis is used as a substitute axis for the capitate as recommended by Larsen et al.[9]

Table 1. Brown et al.[7] Modification of Eaton and Glickel Staging System for Radiographic Assessment of Osteoarthritis

Stage	Description
1	Normal joint
2	Slight joint-space narrowing, sclerosis
3	Marked joint-space narrowing, osteophytes < 2 mm
4	Osteophytes ≥ 2 mm, subchondral cysts, ankylosis

Table 2. Radiographic Parameters and Their Normal Ranges

Parameter	Normal Range
RL angle[10,11]	−15° to 15°
CL angle[13]	−15° to 15°
Radioscaphoid angle[21]	35° to 65°
SL angle[21]	36° to 66°
Carpal height ratio[34–36]	0.462 to 0.608

Following standard convention, the flexion side (palmar) of each carpal angle is positive (+) and the extension side (dorsal) is negative (−).[12]

A DISI deformity was defined as a lunate that was extended by more than 15° on true lateral wrist radiographs.[10,11] Using the system of Yasuda et al,[12] we defined the flexion (palmar) side of each carpal angle as a positive angle and the extension (dorsal) side as a negative angle. A DISI of 15° was designated as an RL angle of −15°. A volar intercalated segment instability of 15° was thus designated as +15°. A radioscaphoid angle of 45° indicated flexion of the scaphoid and was used as a reference for scaphoid position.[13] A radioscaphoid angle of negative −10° indicated extension of the scaphoid beyond the longitudinal axis of the radius. Radiographs were reviewed at the time of presentation and at the last follow-up visit. A standard t test and linear regression methods were used to analyze the data with computer software (JMP 5.1.2; SAS Institute Inc., Cary, NC). The level of significance was set at p less than .05.

The definition of carpal instability is a source of controversy among experts, with some suggesting that malalignment alone is not synonymous with instability.[14] For purposes of communicating our research, we have adopted the conceptual definition of carpal instability as defined by the International Wrist Investigators' Workshop.[15]

Results

From the calendar years of 1994 through 2004, 16 patients with 24 wrists showing STT arthritis and DISI deformity on presenting radiographs were available from a total of 36 patients presenting with isolated STT arthritis (Fig. 1). Twenty patients were excluded because they did not fulfill our criteria for DISI deformity on the presenting radiographs. The median age of the included patients was 60 years (range, 44–88 y), with a women-to-men ratio of 10:6. Right-hand dominance was present in 88% (n = 14) of patients.

A history of antecedent trauma was present in 3