

# SOFT TISSUE STABILIZATION IN THE MANAGEMENT OF CHRONIC SCAPHOLUNATE INSTABILITY WITHOUT OSTEOARTHRITIS A 15-YEAR SERIES

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Management of chronic scapholunate instability without osteoarthritis remains controversial. Some surgeons favor partial wrist arthrodesis ; others, soft tissue stabilization. Many techniques for soft tissue repair have been described but with few or unpredictable results.

We reviewed all our cases of scapholunate instability without osteoarthritis treated by soft tissue stabilization. Since 1979, 37 soft tissue stabilization procedures have been performed to correct dynamic (25) or static (12) scapholunate instability without osteoarthritis. The average time from injury to surgical treatment was 7.2 mos. (range 0.25 to 36 mos.). Three cases were treated within the first month of injury. The choice of repair was determined intraoperatively. The scaphoid shift must be easily reducible to make the case eligible for soft tissue repair. The scapholunate ligament was usually disrupted from palmar to dorsal, and the average amount of disruption was 74%. When scapholunate ligament remnants were of sufficient quality, secondary repair was performed ; but if not, ligament reconstruction using tendon grafts or capsulodesis was performed. The procedures used were secondary ligamentous repair in 16 (by direct suture, reinsertion using anchor and/or transosseous reattachment), ligament reconstruction using tendon grafts in 6, capsulodesis in 7 and a combination of these procedures in 8. The mean follow-up was 27 mos. (range 2 to 62 mos.).

Postoperatively, there was an 83% decrease in pain. The average wrist motion was 60° extension, 47° flexion, 18° radial deviation and 28° ulnar deviation (92%, 84%, 106% and 88% of preoperative values and 88%, 75%, 78% and 76% of the uninvolved wrists, respectively), and the grip strength was 28 kg (117% of preoperative value and 78% of the uninvolved wrists). On roentgenograms, the mean static scapholunate distance was 4.2 mm (a 26% loss of reduction

compared to the early postoperative gap), but scapholunate and radiolunate angles were within normal values (58° and 9°, respectively). At follow-up, one patient presenting a small zone of chondromalacia on the scaphoid at the time of secondary ligamentous repair developed severe radioscaphoid arthritis 15 months postoperatively.

The results were further assessed according to the form of instability, delay before surgery, severity of disruption and type of repair. Patients with static instability showed worse clinical and radiological findings than those with dynamic instability. Surgical delay did not influence the outcome. The more severe the ligament disruption was, the poorer were the results. All types of repair had a comparable outcome except those treated by ligament reconstruction using tendon grafts. The results in the latter group were unsatisfactory in terms of motion, grip strength and radiological findings. This technique has been abandoned by the group.

In conclusion, soft tissue stabilization is part of the armamentarium in the management of reducible chronic scapholunate instability without osteoarthritis. Ligament reconstruction using tendon grafts gave, in our hands, unsatisfactory results. Otherwise, all types of repair achieved a relatively pain-free wrist, with acceptable motion, grip strength, scapholunate and radiolunate angles but with a wider than normal static scapholunate distance. A longer follow-up is needed to assess the effect of this abnormal gap. Factors that favorably affected the outcome were : dynamic type of instability and partial disruption of the ligament.

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Scapholunate dissociation is probably the most common form of carpal instability. Early recognition is essential for optimal treatment. Unfortunately, the diagnosis is frequently delayed. Since the classic article by Linscheid *et al.* (6) in 1972, there has been a controversy as to the best way to manage chronic scapholunate dissociation without osteoarthritis. There are proponents of limited wrist arthrodesis and others of soft tissue stabilization techniques. Many soft tissue stabilization techniques have been proposed, such as direct ligament repair (5), transosseous ligament reattachment, augmentation procedure, ligament reconstruction using tendon grafts (2, 6) and posterior capsulodesis (1).

Unfortunately, the literature does not consistently identify their reliability and predictability. The ideal surgical technique should achieve the following goals : pain-free wrist, with preserved range of motion and grip strength and a normal relationship between carpal bones both in static and dynamic radiologic views. Finally, the technique should be easy, reliable and predictable.

We reviewed all our cases of chronic scapholunate instability without osteoarthritis treated by soft tissue stabilization.

## MATERIAL AND METHODS

From 1979 to 1992, 37 patients with dynamic or static scapholunate instability without osteoarthritis underwent soft tissue stabilization procedures.

There were 29 male and 8 female patients. The mean age was 39 years (18-71 years). Thirty-five patients had a history of acute injury, the most frequent being a fall on the outstretched hand. The dominant hand was involved in 78% of cases.

All patients had disabling pain, usually on the dorsal and radial aspect of the wrist. Pain was rated from 0 to 10 according to a simple scale (table I). The mean preoperative pain score was 6.6 (2-10).

Average preoperative wrist motion and grip strength are summarized in table II. Grip strength was measured

using a dynamometer and averaged 24 kg (66% of the uninvolved wrist).

There were 25 dynamic and 12 static cases of scapholunate instability according to Taleisnik (8). The scapholunate distance (i.e. gap between the lunate and the proximal pole of the scaphoid), scapholunate and radiolunate angles were measured according to Linscheid *et al.* (5) (table III). To avoid interobserver bias the same surgeon (LD) made all the radiographic measurements. The normal scapholunate distance was considered to be 3 mm or less, the scapholunate angle 60° or less and the radiolunate angle 15° or less.

In our first cases, treated as early as 1979, the diagnosis of scapholunate instability was based on static and dynamic xrays. Later on, with the evolution of imaging, arthrography was performed if needed. Later still, MRI was sometimes used ; CT-arthrography (arthroskan) is now our preferred investigation to further define a painful wrist with suspected scapholunate instability. In all cases, there was a correlation between clinical and radiological or arthrographic findings.

Table I. — Classification of pain

Activities	Pain level
At rest	10.0
With light activities	7.5
With moderate activities	5.0
With heavy activities	2.5
No pain	0.

Table II. — Average pre- and postoperative range of wrist motion and grip strength : comparison with uninvolved wrist

Motion (degrees)	Preop (%)	Postop (%)
Extension	65 (93)	60 (88)
Flexion	56 (90)	47 (75)
Radial deviation	17 (77)	18 (78)
Ulnar deviation	32 (86)	28 (76)
Grip strength (kg)	24 (66)	28 (78)

% of uninvolved wrist

Table III. — Average preoperative and postoperative radiologic findings

Radiologic measurements	Preop	Postop
SL <sup>1</sup> distance (mm)	5.1	4.2
SL <sup>1</sup> angle (degrees)	62	58
RL <sup>2</sup> angle (degrees)	13	9

The average delay from injury to surgical treatment was 7.2 mos. (range 0.25 to 36 mos.). Three cases were operated on within the first month of injury. Eighteen were treated between one and 6 mos. and 15 after 6 mos.

At surgery, the severity of the injured scapholunate ligament complex was assessed and expressed in terms of percentage of tear of the whole complex. The scapholunate ligament complex consists of the interosseous membrane between the scaphoid and lunate bones, the radioscapholunate ligament (ligament of Testut and Kuenz) and the superficial dorsal scapholunate ligament.

In four cases, there was only stretching of the complex without a tear. In 18 cases there was complete disruption and in 13, partial disruption.

Of those cases with partial disruption, 11 had a tear extending from volar to dorsal with an average disruption of 74% of the total complex (33-85%). In two patients, the tear was at the proximal part of the ligament, extending volarly and dorsally with approximately 50% of the total complex being disrupted. In one of these two cases, there was, in addition to a tear at the proximal portion of the ligament complex, a small avulsion fracture at the proximal part of the scaphoid. This osseous fragment was still attached to the lunate and was well vascularized.

There were no cases with advanced degenerative osteoarthritis. In four cases, there was a small area of chondromalacia on the proximal scaphoid (3 cases) or lunate (1 case). In another case, there was a small notch over the lunate.

The type of repair was selected depending on pre- and intraoperative findings. In all cases, scapholunate instability was confirmed at surgery. The scaphoid must be easily reducible to be eligible for soft tissue repair as previously pointed out by Taleisnik. Limited carpal arthrodesis was also preferred in heavy laborers.

When there were good ligament remnants, a secondary repair by direct suture, anchor reinsertion and/or transosseous reattachment was the procedure of choice. When degenerative ligament changes had occurred precluding secondary repair, posterior capsulodesis or ligament reconstruction using tendon grafts was performed. Capsulodesis was preferred to ligament reconstruction using tendon grafts in cases where the scapholunate ligament was impossible to reattach.

The selected procedure was secondary ligamentous repair in 16 cases, ligament reconstruction with tendon grafts in 6, posterior capsulodesis in 7, and a combination of secondary repair and posterior capsulodesis in 8.

## SURGICAL TECHNIQUES

The operative techniques were conventional with only a few modifications. A dorsal longitudinal incision centered over Lister's tubercle exposed the dorsal retinaculum which was divided between the third and fourth compartment. The joint was exposed through a straight capsular incision in line with Lister's tubercle. The extent of radiocarpal and intercarpal damage was visualized, and the strategy of repair was decided as described above. Since 1990, distal posterior interosseous nerve resection was included in the operating protocol in 50% of cases.

### 1. In cases with good ligament remnants

The scaphoid was manually reduced, and over-reduction to a scapholunate angle of 40° was performed. When possible, direct approximation of the ligament remnants was performed using 4/0 nonabsorbable suture. When there was avulsion of the complex from the scaphoid, reinsertion by a small Mitek anchor and/or transosseous reattachment according to Taleisnik's technique was performed. Stability of the repair was assessed, and if reinforcement was necessary, posterior capsulodesis was also performed. Soft tissue repair was stabilized with percutaneous K-wires (usually one or two across the scapholunate joint and another one or two crossing the scaphoid and capitate).

### 2. In cases without good ligament remnants

#### a) *Posterior capsulodesis*

The technique of posterior capsulodesis described by Imbriglia (4) was used: a 1-cm wide, proximally-based ulnar capsular flap was raised and percutaneous K-wires were inserted, as previously described, to stabilize the scaphoid to the lunate and capitate. The capsular flap was placed under tension dorsally on the dorsally extended wrist and was either directly sutured or reinserted using an anchor to the distal part of the scaphoid.

### b) Ligament reconstruction using tendon grafts

The first two ligament reconstructions were based on Palmer, Dobyns and Linscheid's technique (7), and the last four, on Howard, Fahey and Wojcik's technique (3).

In four cases, further augmentation of the repair was performed using the dorsal carpal ligament which was detached from its ulnar border, applied and sutured over the scapholunate ligament (Linscheid). This was used in one case with a direct suture, one ligament reinsertion, one combined direct suture and capsulodesis and one combined direct suture, transosseous reattachment and capsulodesis.

Postoperatively, the wrist was immobilized for six to eight weeks in a bulky dressing incorporating a short-arm plaster splint. This splint was kept until swelling had subsided, at which time a well-fitted short-arm thumb spica was applied, following which gentle physiotherapy was begun. K-wires were removed after eight to ten weeks, and physiotherapy was intensified.

In 13 cases (35% of patients), another traumatic wrist lesion was present; in eight of these cases, the lesion was treated at the time of scapholunate instability repair (table IV).

Table IV. — Associated injuries

Associated injuries	Number
Scaphoid fracture (fx)	2
Hamate fx-luxation	1
Triquetrum fx + TFCC tear	1
Lunotriquetral + TFCC tears	3
Distal radius fx	2
Distal radius fx + distal ulnar fx	2
Distal radius fx + digit fx	1
Proximal ulnar fx	1
Total	13

## RESULTS

The average length of follow-up was 27 months (2-62). The mean postoperative pain score was 1.1 (0-4). Compared to preoperative scores, this is an 83% decrease in pain.

Postoperative range of motion and grip strength are reported in table III. In comparison with preoperative values, there was usually a slight

decrease in range of motion but the grip was stronger.

Postoperative radiologic measurements (table III) were performed on static views; the average scapholunate distance was 4.2 mm. The scapholunate gap was 3 mm or less in 46.4% of cases, between 3 and 4 mm in 14.3% and greater than 4 mm in 39.3%. The scapholunate angle was 60° or less in 62.1%, between 60° and 70° in 20.7% and greater than 70° in 17.2%. The radiolunate angle was 15° or less in 75.9% of cases. On dynamic views, the scaphoid kinematic was considered normal in 64.0% of cases.

In one case, a *Staphylococcus* pin-tract infection occurred, and premature removal of the K-wire was performed one week postoperatively. In two cases, lunate condensation was present preoperatively and postoperatively on xray.

One patient developed radioscapoid arthritis. This 37-year-old right-handed patient severely injured his right hand after a fall. He presented an extra-articular fracture of the distal radius, an ulnar styloid fracture, instability of the distal radioulnar joint, and scapholunate instability. At surgery, a small zone of chondromalacia was present over the posterosuperior part of the scaphoid. At 15 months postoperatively, radioscapoid arthritis was present. Otherwise, no patients have undergone secondary surgery because of surgical failure or degenerative changes.

Before surgery, 58.1% of patients were heavy manual workers, of whom 83.3% were able to return to their original employment. One patient was no longer able to work as an automobile mechanic. A mason had an excellent postoperative outcome but did not return to work because of an increased lunate condensation with pain. Another patient, an automobile mechanic who had sustained a work-related injury, did not return to work for unclear subjective reasons not substantiated by objective findings.

### Type of repair

Four groups were formed based on the type of repair used. The groups were compared in terms of delay of repair, form of instability and amount of disrupted ligament complex (table V). The

Table V. — Type of repair : delay from injury to surgical repair, form of instability and amount of disrupted scapholunate ligament complex

Type of repair (number of cases)	Average delay months (range)	% of disruption
Secondary repair (16)	6.5 (0.25 to 36)	76.6*
Direct suture (7)	3.7 (1 to 13)	61.8
Anchor reinsertion (5)	11.6 (0.25 to 36)	91.5*
Transosseous reattachment (1)	8.0	85.0
AR+TO (2) <u>24/36</u>	6.4 (4.75 to 8)	75.0
DS+TO (1)	5.0	100.0
Ligament reconstruction (6)	11.2 (4 to 28)	75.0
Posterior capsulodesis (7)	6.7 (2 to 18)	42.9
C + Secondary repair (8)	5.7 (0.25 to 14)	100.0
Total	7.2 (0.25 to 36)	74.1*

DS = direct suture ; AR = anchor reinsertion ; TO = transosseous reattachment ;  
C = posterior capsulodesis.

shortest average delay from injury to surgery was in the group of secondary ligament repair (6.5 mos.) and the longest, in the one with ligament reconstruction using tendon grafts (11.2 mos.). Dynamic instability was prevalent except in the group treated by ligament reconstruction.

The postoperative pain score was low and almost identical in all groups. In cases treated by ligament reconstruction, wrist motion was significantly reduced in all directions. In the group treated by posterior capsulodesis, wrist flexion was considerably lower (65% of the uninvolved wrist) when compared to the group who had secondary repair. The average grip strength was significantly lower in cases treated by ligament reconstruction using tendon grafts (43% of contralateral wrists compared to 83, 84 and 87% in the other groups).

Radiological findings are summarized in table VI. In all groups, the average scapholunate distance was greater than normal. The poorest results were obtained following ligament reconstruction. The average scapholunate and radiolunate angles were normal in all groups except in the one treated by ligament reconstruction, who presented a 69° scapholunate angle.

#### Delay between injury and surgical treatment

Groups were formed to assess the influence of the timing of repair on the results. Range of

motion and grip strength were comparable. Scapholunate and radiolunate angles were equivalent but scapholunate distance was more important (6.0 mm) in the group of three cases treated within one month. This may be explained by the fact that these three patients showed a severe lesion of the scapholunate ligament complex (complete tear in all of them) and also presented a static form of instability.

#### Instability type

Results were also assessed according to the dynamic or static type of instability. In static instability, average wrist motion was lower in all directions as well as grip strength. Mean scapholunate distance was also significantly more important. We tried to further assess this group by comparing the severity of the scapholunate ligament complex disruption and the acute or chronic type of the lesion (table VII). The patients in the static group had a more severe lesion of the ligament complex but were treated earlier.

#### Severity of scapholunate complex ligament lesion

The results were assessed according to the amount of disrupted complex. Wrist motion was slightly lower in the group who had complete disruption. However, the more severe the lesion,

Table VI. — Postoperative results : Type of repair — radiologic measurements

Type of repair (number of cases)	SL distance (mm)	SL angle (degrees)	RL angle
Secondary repair (16)	3.7	58	10
Direct suture (7)	3.6	53	6
Anchor reinsertion (5)	3.7	65	11
Transosseous reattachment (1)	7.0	63	3
AR+TO (2)	3.0	58	14
DS+TO (1)	2.0	67	30
Ligament reconstruction (6)	6.0	69	10
Posterior capsulodesis (7)	3.6	54	3
C + Secondary repair (8)	5.3	58	12
Total	4.2	58	9

DS = direct suture ; AR = anchor reinsertion ; TO = transosseous reattachment ; C = posterior capsulodesis ; SL = scapholunate ; RL = radiolunate.

Table VII. — Postoperative results : Form of instability — radiologic measurements

Form of instability (number of cases)	Scapholunate distance (mm)	SL angle (degrees)	Radiolunate angle (degrees)
Dynamic (25)	3.3	57	9
Static (12)	5.7	58	9
Total (37)	4.2	58	9

the worse were the grip strength and radiological findings.

## DISCUSSION

More than 20 years after Linscheid *et al.* published their classic article, the management of scapholunate dissociation is still a subject of debate, especially in chronic cases. The ideal surgical technique should achieve the following goals : a pain-free wrist, with an acceptable range of motion and grip strength and radiologic evidence of appropriate reduction. Furthermore, the technique should be easy to perform and reliable.

In our experience, management of chronic reducible scapholunate instability without osteoarthritis by soft tissue stabilization gave relatively pain-free wrists, with appropriate wrist motion and grip strength. The xray findings were normalized except the scapholunate gap. Only 45.2% of patients achieved a normal scapholunate distance

postoperatively. The average scapholunate distance was 4.2 mm which is a 26% loss of reduction compared to the early postoperative gap. This loss of reduction is consistent with previous articles. It has been suggested that a scarred incompetent ligament may contribute to postoperative loss of reduction. Interestingly, the scaphoid shift in dynamic views was considered totally normal in only 64.0% of cases.

Persistence of a gap means that instability was not completely eliminated. According to the literature, late degenerative changes may occur. The natural history is as follows : ligament damage leads to collapse deformities and later to degenerative arthritis. One important point is that a collapse deformity is present before the onset of degenerative arthritis. Normally, progression of these changes occurs in three stages : arthritis is at first limited to the tip of the styloid process, it then extends to the radioscapoid joint and finally to the capitulum joint (10). The occur-

rence and delay before the onset of radioscaphoid arthritis in cases of scapholunate dissociation has been studied. Radiocarpal joint arthritis may occur as early as 3 months. In our series, a scapholunate gap of more than 3 mm and a scapholunate angle greater than  $60^\circ$  was observed in 20% of cases. In these cases, the mean postoperative scapholunate distance was 7.25 mm (3.5-9.0 mm) and the scapholunate angle  $70^\circ$  (63-85 $^\circ$ ). The average follow-up for this group of patients was 33.8 mos. (13-49 mos.). In none of these patients was there evidence of radioscaphoid arthritis. Absence of arthritis in our series probably results from the partial reduction of the scaphoid, and this may have contributed to decreasing the effects of loading and thus to preventing or at least delaying the development of arthritis. According to Watson's "teaspoon" analogy, the sequence of degenerative changes is based on and caused by an articular alignment problem between the scaphoid and radius. Viegas *et al.* (10) stated that in wrists with significant scaphoid instabilities, the scaphoid assumed a palmar flexed orientation, and this may explain why advanced radioscaphoid degenerative changes are seen. They emphasized the variability of instability patterns and that the more severe the incongruity, the greater are the chances of arthritis. Similarly, we think that an isolated wider scapholunate distance with a scaphoid with a normal angulation both in static and dynamic views is not necessarily sufficient to allow the development of a collapse deformity and subsequently arthritis. In our opinion, the most important feature to restore in scapholunate instability is both the static and dynamic angulatory relationship of the scaphoid. Further follow-up will probably give us the clinical answer. In our series, one patient developed degenerative changes. This patient had a zone of chondromalacia that had been relocated in a loaded position by the reduction: this was a bad indication. However, none of other patients with either an area of chondromalacia (3) or a notch over the lunate (1) had evidence of degenerative changes. The mean follow-up of these four patients was 24.8 mos. (6-46 mos.). All these cases should be individually analyzed at the time of surgery before a treatment is selected.

### Type of repair

In our series, the type of repair has influenced the results. Ligament reconstruction using the techniques of Linscheid *et al.* or Howard *et al.* gave unsatisfactory results in terms of motion, grip strength and xray findings. The results were correlated with different authors who stated that the outcome was "variable", "poor", "good" or "not consistently reliable". In the series of Palmer *et al.* (7), scapholunate distance was normal in only 6 of 30 patients, angulatory relationships of the carpus were normal in less than half of cases, and Dorsal Intercalated Segment Instability frequently recurred postoperatively. The conclusion of this study was that this procedure was less than ideal because of possible attenuation during the healing process, drill holes produce a weakened area in the bone which becomes a site of potential fracture, the blood supply to the bones may be disrupted and finally, fibrosis is induced by the extent of the procedure.

Secondary repair and/or capsulodesis gave comparable postoperative results with a mean scapholunate gap of 4.0 mm. The group treated by posterior capsulodesis showed a marked decrease in wrist flexion ( $41^\circ$ ). This is consistent with the philosophy of capsulodesis, since the capsular flap on the posterior aspect of the scaphoid limits palmar flexion.

Unfortunately, we could not compare our results with previous reports because the surgical techniques or the patient groups are different. Taleisnik (8) in his series of 21 patients performed a combination of capsulodesis and transosseous reattachment in 14 patients, transosseous reattachment alone in four and posterior capsulodesis in three. He emphasized that the scaphoid must be reducible for this type of repair. His results were satisfactory. He stated that he now routinely combines capsulodesis and ligamentous repair.

### Delay before surgical treatment

Management of scapholunate dissociation has historically been associated with the acuteness and chronicity of the lesion. To date, the exact line between acute and chronic scapholunate instability

has not been sharply defined. Some authors suggest a delay of 3 weeks, others 4 weeks with subacute lesions from 4 to 24 weeks, and for others chronic scapholunate dissociation implies that primary repair of the ligamentous damage cannot be done and that some sort of reconstruction is required.

In our series, the timing of surgery was not the determinant factor in the selection of repair. The choice of repair was primarily dictated by the presence of a reducible scaphoid, osteoarthritis and ligament remnants. Although the average delay before surgical treatment was lower in cases treated by secondary repair, ligament remnants were of sufficient quality even 36 months after the injury. Taleisnik had performed secondary repair as long as 84 months posttrauma.

Also, the delay between the injury and surgical treatment has not influenced the outcome except perhaps for the small group of three patients who were operated within one month and who showed a greater scapholunate distance than the other groups.

### Severity of scapholunate ligament lesion

In our series, the severity of the scapholunate ligament lesion was variable. The amount of disruption had little influence on postoperative motion but grip strength and all xray findings became worse as the amount of disruption increased. The pattern of disruption was from the volar to dorsal aspect in 84.6%, and this is consistent with the literature. In the remaining cases, the lesion was at the median portion of the complex.

In only 51.4% of cases was there complete disruption. Numerous and controversial experimental studies have been published on the importance of the scapholunate ligament in scaphoid stability. According to Taleisnik (9), dynamic forms of instability may be explained by partial tears or attenuation of the ligaments between the scaphoid and lunate and static instability is an entirely different matter. This is consistent with our findings. The dynamic form of instability showed a mean of 65.4% disruption compared with 92.5% in cases with static instability.

Our study demonstrated that scapholunate instability may occur even when the scapholunate ligament complex is partially disrupted (37.1% of cases) or not disrupted at all but attenuated and incompetent (11.4% of cases). Discrepancies between our results and experimental studies may be explained by the fact that the amount of disrupted ligament is only one of two important factors. The mechanical properties of the injured ligament are at least as important as the anatomical percentage of disrupted ligament. In fact, the amount of disruption may underestimate the severity of the lesion, as adjacent portions of the ligament are certainly also injured, probably healed and attenuated and may be incompetent even if there is anatomical continuity. We think, the results of experimental studies cannot be totally applied clinically because they probably do not reflect the exact reality. These studies evaluate the effect of ligament section on scapholunate stability in an otherwise non-attenuated ligament. This notion of "plasticity" of the wrist ligaments, which develops when the "elastic limit" of the ligament is exceeded has been evaluated experimentally.

### Type of instability

In our series, the type of instability influenced the results. The static group showed worse motion, grip strength and a larger scapholunate gap than the dynamic group. The amount of disruption was higher in the static group as stated earlier, but the average delay between injury and surgical repair was smaller.

### CONCLUSION

In our study, soft tissue stabilization is part of the armamentarium in the treatment of chronic reducible scapholunate instability without osteoarthritis. Ligament reconstruction using tendons gave unacceptable results and has been abandoned by our group. Otherwise, soft tissue repair is effective in providing a pain-free wrist with acceptable wrist motion and grip strength. Radiological measurements are usually normal except for the scapholunate gap.



Our short-term follow-up shows that this does not lead to significant early degenerative changes of the wrist. We suggest that the most important factor to prevent osteoarthritis is to restore normal angulatory relationships between the scaphoid and lunate bones in static and dynamic radiologic views. An isolated abnormal scapholunate distance is probably of less importance in the etiology of degenerative changes. Our study also demonstrated that dynamic instability and partial disruption of the ligament favorably affect the outcome.

Based on our findings, we suggest the following therapeutic guidelines: Soft tissue repair should be considered in all cases of reducible chronic scapholunate instability without osteoarthritis. When good ligaments are present, secondary repair is an appropriate treatment; it may be combined with posterior capsulodesis, depending on the solidity of the repair obtained. In cases without adequate remnants, posterior capsulodesis may be performed to restore the scaphoid angulatory relationship, not only statically but also dynamically, especially in cases with a minimal scapholunate gap (4 mm or less). When the scapholunate gap is greater or when the scaphoid is not reducible, limited carpal arthrodesis is preferred.

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## SAMENVATTING

*P. SAFFAR, C. SOKOLOW, L. DUCLOS. Weke-delen operaties voor de behandeling van scapholunare instabiliteiten zonder arthrose: 15 jaars ervaring.*

De behandeling van chronische scapholunare instabiliteit (SLI) is nog controversieel. Sommigen verkiezen een arthrodesis, terwijl anderen eerder voor weke-delen stabilisatieingrepen opteren.

We hebben onze patiënte met deze weke-delen ingrepen nagekeken van 1979 tot heden: 37 ingrepen voor statische (25) of dynamische (12) SLI werden weerhouden; de gemiddelde duur tussen trauma en ingreep bedroeg 7.2 maanden. De makkelijke reduceerbaarheid van het scaphoid was het criterium om naar een weke-delen procedure over te gaan.

Het scapholunare ligament was meestal palmar en dorsaal geavulseerd over een gemiddelde van 74% van zijn totale lengte. Wanneer de boorden voldoende houvast hadden werd een sutur of reinsertie uitgevoerd, zoniet een capsulodesis of ent. Bij 16 werd een directe sutuur, bij 6 een ent-reconstructie, bij 7 een capsulodesis en bij 8 een gecombineerde ingreep uitgevoerd. De gemiddelde follow-up was 27 maanden.

De pijn verbeterde met 83%; De gemiddelde beweeglijkheid was 60° extensie, 47° flexie, 18° radiale en 28° ulnaire inclinatie. (resp 92%, 84%, 106% en 88% van de preoperatieve waarden en 88%, 75%, 78% en 76% van de contralaterale waarden). De grijpkracht was 28 kg (117% van de preoperatieve en 78% van de contralaterale waarde).

Radiografisch was er een scapholunare gap van 4,2 mm of een verlies van 26% t.o.v. de onmiddellijk postoperatieve waarde, maar de scapholunare en radiolunare hoek bleven normaal (resp. 58° en 9°). Eén patiënt met een zone van chondromalacie op het scaphoid heeft op 15 maanden een flinke radioscaploïdale arthrose ontwikkeld.

De resultaten werden beoordeeld naar de duur van het interval, type instabiliteit, hersteltechniek en ernst van

het ligementair letsel. Statische instabiliteiten scoorden minder goed dan dynamische; het interval trauma-ingreep had geen invloed, ernstige ligamentletsels deden het minder goed dan de minder ernstige, en alle hersteltechnieken hadden een gelijkaardig resultaat, behalve de ent-reconstructies. Deze techniek werd dan ook verlaten.

Besluit: Weke-delen ingrepen voor SLI gaven een relatief pijnloze pols, een aanvaardbare beweeglijkheid en grijpkracht, normale scapholunare en radiolunare hoeken doch een toegenomen scapholunair interval. Onderzoek op langere termijn is noodzakelijk om de verdere evolutie te volgen. Beïnvloedende factoren zijn het type instabiliteit en de ernst van het ligementair letsel.

### RÉSUMÉ

*P. SAFFAR, C. SOKOLOW, L. DUCLOS. Les opérations sur les parties molles dans le traitement de l'instabilité scapho-lunaire chronique sans arthrose. Expérience de 15 ans.*

Le traitement de l'instabilité scapho-lunaire chronique reste controversé. Certains privilégient l'arthrodèse de poignet, d'autres, les opérations stabilisatrices sur les tissus mous. De nombreuses techniques ont été décrites pour la réparation des parties molles.

Nous avons revu nos cas d'instabilité scapho-lunaire sans arthrose traités depuis 1979: 37 opérations sur les tissus mous ont été réalisées pour corriger des instabilités dynamiques (25) ou statiques (12). Le délai entre le traumatisme et le traitement chirurgical était en moyenne de 7,2 mois. Le choix de la technique de réparation a été fait en per-opératoire. La réductibilité aisée de la bascule du scaphoïde était une condition essentielle au choix d'une opération sur les parties molles.

Le ligament scapho-lunaire était habituellement rompu de palmaire en dorsal; la rupture portait en moyenne sur 74% du ligament. Lorsque les restes du ligament étaient de qualité suffisante, une réparation secondaire a été réalisée, sinon une reconstruction par greffes ou une capsulodèse. Au total, 16 patients ont eu une

réparation ligamentaire (par suture directe, réinsertion transosseuse ou par hameçon), 6 ont eu une reconstruction par ligamentoplastie, 7 ont eu une capsulodèse et ces techniques ont été associées chez 8 autres. Le suivi moyen était de 27 mois.

Après l'opération, la douleur a été réduite de 83%. La mobilité était en moyenne de 60° d'extension, 47° de flexion, 18° d'inclinaison radiale et 28° d'inclinaison ulnaire (92%, 84%, 106% et 88% des valeurs préopératoires et 88%, 75%, 78%, et 76% des valeurs du côté opposé); la force de préhension était de 28 kilos (117% de la valeur pré-opératoire et 78% de la valeur du côté opposé).

Sur les radiographies, l'écart scapho-lunaire statique était en moyenne de 4,2 mm (soit une perte de 26% par rapport au post-opératoire immédiat) mais les angles scapho-lunaire et radio-lunaire étaient dans des limites normales (58° et 9°). Un patient qui présentait une petite zone de chondromalacie sur le scaphoïde au moment de l'opération a développé en 15 mois une arthrose radio-scaphoïdienne avancée.

Les résultats ont été analysés en fonction du type d'instabilité, du délai avant l'opération, de la gravité de la lésion ligamentaire et du type de réparation. Les instabilités statiques ont donné de moins bons résultats cliniques et radiologiques que les instabilités dynamiques. Le délai pré-opératoire n'a pas influencé le résultat. Les résultats étaient d'autant moins bons que les lésions ligamentaires étaient plus graves. Tous les types de réparation ont donné des résultats comparables, à l'exception de la reconstruction ligamentaire par greffes, qui a donné des résultats médiocres en ce qui concerne la mobilité, la force de préhension et les constatations radiologiques. Cette technique a été abandonnée par notre équipe. Tous les autres types de réparation ont donné un poignet relativement indolore, avec une mobilité et une force de préhension acceptables, des angles scapho-lunaire et radio-lunaire corrects, mais avec un écart scapho-lunaire statique supérieur à la normale. Il faudra un suivi de plus longue durée pour évaluer l'effet de cet écart excessif. Les facteurs qui ont influencé favorablement le résultat étaient le caractère dynamique de l'instabilité et le caractère incomplet de la rupture ligamentaire.