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Original article

Bone-ligament-bone Cuenod grafting technique modified by Saffar-Romano for the treatment of chronic scapho-lunate dissociation

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Summary. *Background and aim of the work:* The authors show their experience about six patients suffering of chronic scapho-lunate (S-L) dissociation treated with the Cuenod method modified by Saffar-Romano. *Methods:* Clinical assessment was performed in all patients and compared before and after surgery at follow-up measuring pain value through the VAS, ROM of the wrist with a goniometer, grip strength by Jamar test, functional outcome with the Italian version of the Disability of Arm, Shoulder and Hand (DASH) score. Radiological assessment consisted in measuring S-L angle and classifying radio-carpic and inter-carpic osteoarthritis. *Results*: At radiographic check-up the reduction of the dissociation remained within the normal range of S-L angle (30°-60°) in 5/6 patients (83%). Clinical results were satisfactory for all the patients due to complete absence of pain and a good recovery of wrist function with more than 80% of the force and mobility compared to the contralateral side for three patients, and a recovery of more than 60% of the force and mobility for another patient. Mean DASH score was 8. All the patients returned to their previous job after a mean time of 4 months. *Conclusions:* Cuenod modified by Saffar-Romano grafting technique can be considered a brilliant solution for chronic S-L dissociation where S-L ligaments are completely worn included cases of SLAC I wrist. (www.actabiomedica.it)

Key words: scapholunate, dissociation, ligament, reconstruction, graft, bone-ligament-bone, wrist, carpal instability, chronic, repair

Introduction

The treatment of chronic Scapho-Lunate (S-L) dissociation without osteoarthritis (Fig. 1) is still a challenge to date. Some authors suggest to perform a partial arthrodesis of the wrist (1-6), others a stabilization fixing the soft tissues as through the Blatt capsulodesis or Brunelli technique (7,8).

Cuenod proposed the stabilization by the S-L ligament reconstruction associated with a partial dorsal capsulodesis (9).

In literature many papers report about experiences to detect the ligament that can best replace the interosseous S-L ligament (10-19).

Sometimes a double palmar and dorsal approach can be used (20).

Both authors contributed equally to this manuscript and thus are to be considered both 1st author

Figure 1. X-ray in A/P view evidencing S-L dissociation

In the Cuenod technique the dorsal ligament between trapezoid and 2nd metacarpal bone is harvested with the two bony blocks at both ends (Fig. 2, 3).

The technique of Cuenod modified by Saffar and Romano (14) seems to be particularly effective in maintaining carpal stability. These two authors fix the two bony blocks with titanium screws and do not perform any capsulodesis believing it is not needed for the negative effect on the flexion and extension of the wrist during rehabilitation.

Aim of the surgical intervention is to reconstruct the interosseous S-L ligament, to definitively stabilize the S-L joint and thus all the wrist, avoiding recidive S-L dissociation. Moreover, from a biomechanical point of view, scaphoid motion must be strictly connected with that of the lunate with the maintenance of a correct S-L angle.

Purpose: Aim of the paper is to present our experience with this technique.

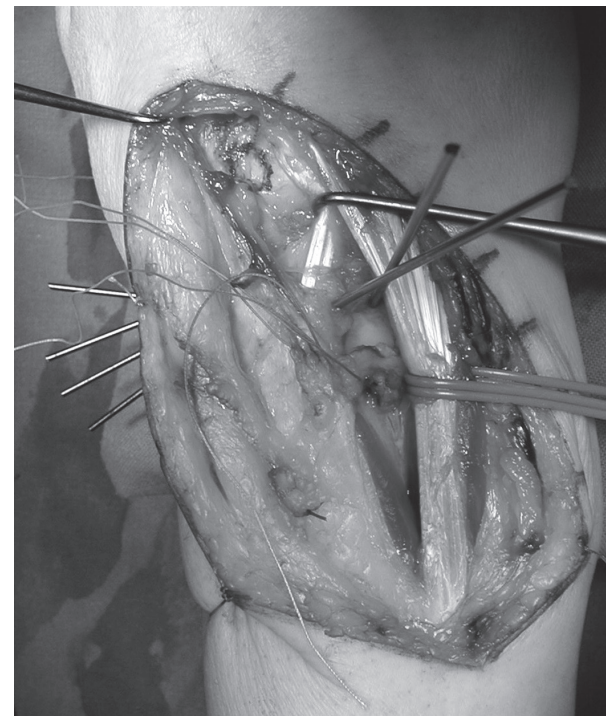

Figure 2. Operative phase in which dorsal ligament between trapezoid and 2nd metacarpus is highlighted and harvested as Bone-Ligament-Bone (B-L-B) graft

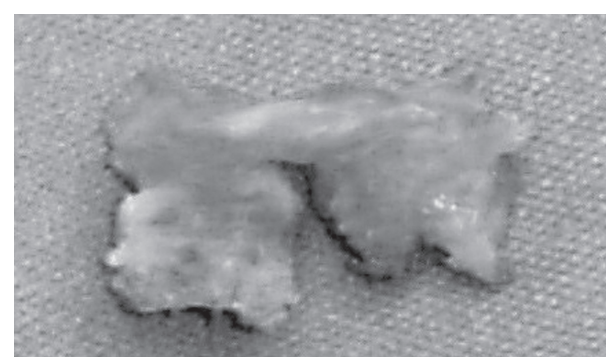

Figure 3. Trapezoid-2nd metacarpus B-L-B autograft (harvested)

Materials and methods

Patients and outcomes

We operated on six wrists of six patients for chronic post-traumatic S-L dissociation. They were all males with mean age of 41,8 years (min. 27, max 54), five of which operated at the right wrist and one at the

left. Four were hand workers and two employees. All patients were checked up with physical examination and X-ray with mean follow-up of 75,7 months (min. 46, max 112). Clinical assessment was performed and compared before and after surgery at follow-up measuring pain value through the VAS, ROM of the wrist with a goniometer, grip strength by Jamar test, functional outcome with the Italian version of the Disability of Arm, Shoulder and Hand (DASH) score (21) because all the patients were Italians (22). Radiological assessment consisted in measuring S-L angle and classifying radio-carpic and inter-carpic osteoarthritis.

X-rays were performed in standard views and compared with contralateral side detecting the widening of the room between the two bones (S-L) with consequent interruption of the ring made by the two carpal rows in the A/P view (Fig. 1), and an altered S-L angle in L/L views. Preoperative MRI allowed us to verify the exact S-L gap confirming the ligament lesion with complete degeneration.

Surgical technique

Patient lies in supine decubitus with brachial plexus anaesthetic block. A tourniquet is placed on the arm. Wrist is approached dorsally with a longitudinal sinuous incision centred over the fourth extensors compartment. Common extensor digitorum tendons are displaced on the ulnar side and the radio-carpal articular layer is reached. Dorsal interosseous nerve is electrocauterized and denerved and a squared capsular flap proximally based is harvested in the respect of the dorsal intercarpal ligament as previously described (23).

The space between scaphoid and lunate bones is then highlighted (Fig. 4) and the scary tissue is taken off. Through a joystick maneuver the S-L joint is reduced and then stabilized under fluoroscopic control by percutaneous Kirschner wires as follows: 2 S-L wires, 1 between scaphoid and capitate and eventually 1 between radius and lunate if DISI remains still uncorrected. In only one patient radial styloidectomy was performed.

The joint between the base of the 2nd metacarpal bone and the distal portion of the trapezoid has to be detected (Fig. 2) to harvest a compound graft which includes two bony blocks at the extremities with an interposed very short strip of capsular-ligamentous tissue (Fig. 3). Two drill holes are then performed, one in the scaphoid and the other in the dorsal horn of the lunate, to insert the bone blocks of the bone-ligament-bone (B-L-B) graft. Osteosynthesis of the graft with the scaphoid and lunate is made with a titanium microfragments screw at each side (usually 14mm long for navicular and 10mm for scaphoid) (Fig. 5, 6). Stability of the implanted system is then verified and every anatomical layer (especially the articular capsule) is sutured for accurate reconstruction.

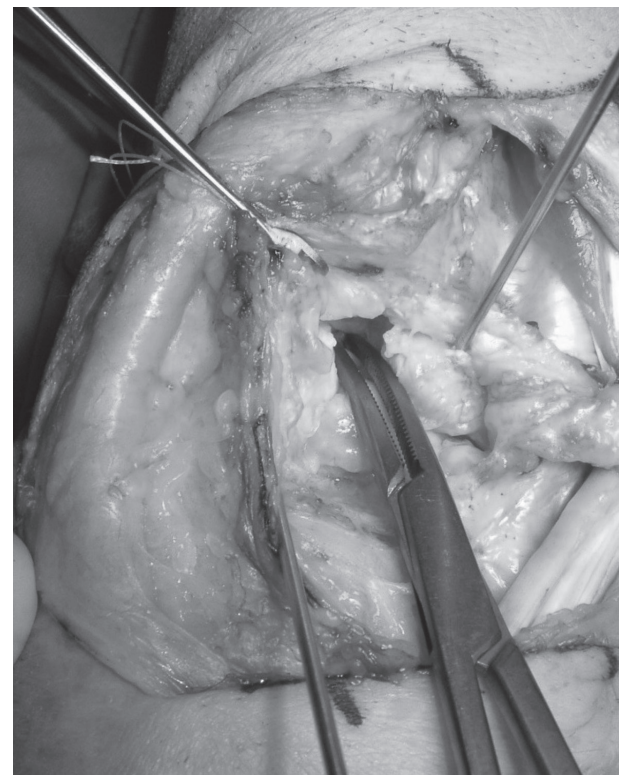

Figure 4. Highlight of the space between scaphoid and lunate

Postoperative treatment

An antebrachio-metacarpal plaster cast is worn for 60 days. Kirschner wires as well are taken off at 60 days post-op. and then functional rehabilitation begins.

Results

Results are summarized in table 1.

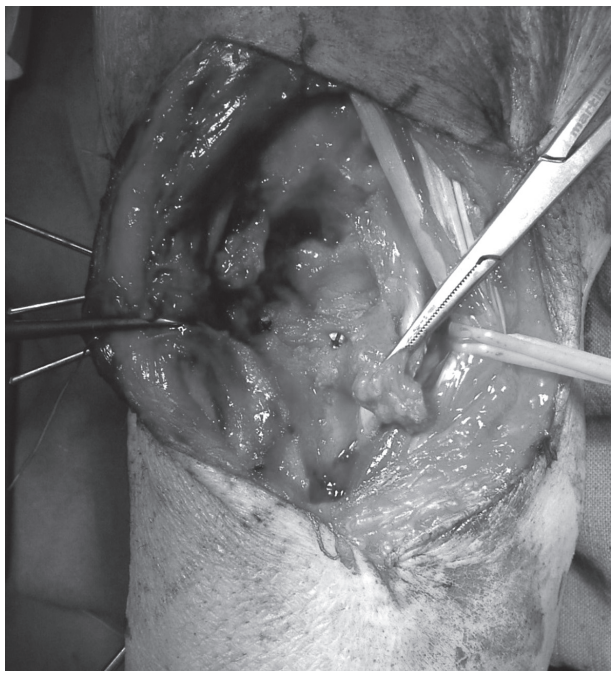

Figure 5. B-L-B graft stabilized by the screws

Painful wrist worsened by even minimal effort was present in all cases with Visual Analogue Scale (VAS) mean value of 6,3/10. Range of Movement (ROM) was reduced in all cases with a mean of 65°. Grip strength evaluated with the Jamar test was significantly reduced in all cases (mean value: 14,8 Kg). At pre-op. X-ray evaluation all patients presented a static S-L dissociation non complicated by radio-scaphoideal osteoarthritis; only two patients showed a light stylo-scaphoideal osteoarthritis (SLAC I).

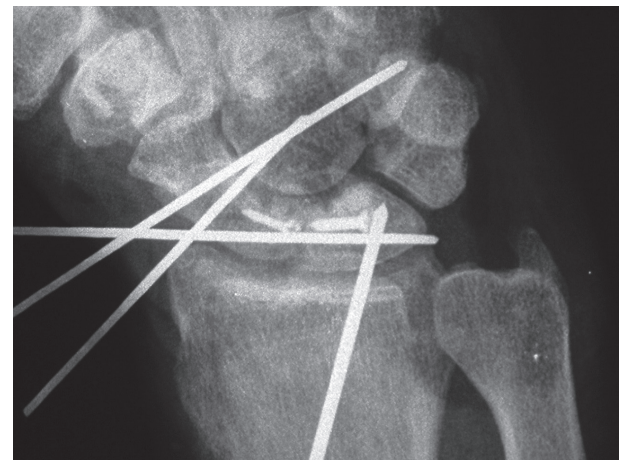

Figure 6. X-ray check showing good reduction of S-L dissociation stabilized by Kirschner wires and the B-L-B autograft fixed by screws

At follow-up clinical examination, pain was absent (VAS=0) in 4/6 (66,6%) patients and light (VAS 1 and 2 /10) in the other 2/6 patients.

ROM and strength were improved in all wrists (100%).

DASH score had a mean value of 8.

At X-ray control reduction of S-L dissociation was kept in all cases; S-L angle was maintained in the normality range (30°-60°) in 5/6 patients, while in 1/6 an ulnar instability was detected with ulnar sliding of the carpus.

In one case the patient showed an intolerance to the srews after one year from the intervention and thus the patient underwent a second surgical intervention for screws removal. None of the other cases showed

Table 1. Age of the patients, follow-up and pre and post-operative outcomes

Patient	Age (years)	F.up (months)	S-L angle (normal = 30°-60°)		DASH score	Strength (Kg)		Pain (VAS 0-10)		ROM FLEX		ROM EXT	
			Pre -op	Post -op	Post-op	Pre -op	Post -op	Pre -op	Post -op	Pre -op.	Post -op	Pre -op	Post -op
T.G.	42	112	85°	50°	5	12.4	25.2	6	0	20°	35°	35°	55°
M.A.	53	96	91°	60°	7	15.8	24.8	7	1	25°	40°	40°	55°
R.M.	39	93	75°	80°	22	11.7	18.5	8	2	40°	55°	25°	35°
S.F.	54	58	45°	40°	10	16.6	28.5	6	0	20°	30°	30°	50°
D.C.	27	49	86°	38°	4	16.8	29.1	6	0	40°	55°	35°	60°
P.A.	36	46	92°	56°	2	15.7	30.4	5	0	35°	50°	45°	65°
Mean	**41.8**	**75.7**	**79°**	**54°**	**8.3**	**14.8**	**26.1**	**6.3**	**0.5**	**30°**	**44.2°**	**35°**	**53.3°**

signs of osteolysis or intolerance to the screws at follow-up.

All the six patients returned to their previous job (4/6 hand workers) after a mean time of 4 months from the surgical intervention.

Discussion and conclusions

We believe this surgical technique needs an accurate and respecting detection of the different anatomical structures. Very important to achieve is the anatomical reduction of the S-L dissociation and its stabilization with Kirschner wires inserted in manner of keeping effectively the reduction but without interfering with screw insertion. Particular attention has to be payed in making the perforations for the screws in the two very small bony blocks of the graft because of their extreme fragility.

Post-operatory X-rays showed maintenance of the S-L reduction and a good correction of the S-L angle demonstrating a solid anchorage of the neoligament.

Clinical checks highlighted good results on pain and strength rescue as well as on ROM improvement, implicating high levels of patients' satisfaction with a good rescue of quality of life (24).

Reconstitution of normal relationships between scaphoid and lunate renders to the carpus its physiological biomechanical properties. Therefore a sharp surgical technique is needed, followed by a dedicated and constant rehabilitative phase.

This technique is to be reserved to those cases of chronic S-L dissociation where S-L gap reduction can be possible and in those cases in which is not already present a radio-scaphoideal osteoarthritis. On the other hand in those cases of isolated stylo-scaphoideal osteoarthritis (stage I SLAC wrist), in addition to the S-L ligament reconstruction, we think it should be performed a partial resection of the radial styloid to avoid a stylo-scaphoideal impingement.

In conclusion, beneath our case serie is represented only by six patients, on the base of the good clinical and radiographic results in most of them, we can consider the Cuenod modified by Saffar-Romano technique a brilliant solution for chronic S-L dissociation where S-L ligaments are completely worn included cases of SLAC I wrist.

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