

“Regressive” patho-mechanics of Distal Radius Fractures, and savage by reconstruction of coxa manus

GAETANO MAURIZIO GRIPPI

Hand Surgery in UOA of Orthopaedic, S. Lazzaro Hospital, Alba (Cuneo) - ASL CN2 of Piedmont, Italy, e-mail: gmrippi@libero.it, www.chirurgia-mano.org

SUMMARY

Distal Radial Fractures are common and have “regressive” patho-mechanics as origin. For their care, particularly useful is the Coxa Manus Reconstruction (CMR) that consists in a volar radius-lunate- (hemi-scaphoid) arthrodesis with scaphoid distal resection. In the period 2002-2015 we have been successful in about 90% of cases.

KEY WORDS

Distal radial fractures; coxa manus reconstruction; paleo-carpus; neo-carpus.

Received 21.03.2016; accepted 02.05.2016; printed 30.05.2016

INTRODUCTION

Frequent outcome of Distal Radius Fractures (DRF) is radio-carpal stiffness, with spontaneous reset of carpal kinetics so the residual movement is transferred in the mediocarpal joint, on the capitate's head (Fig. 1). In this case, joint movement is prevalent on capitate's head with relative immobility of the lunate.

This opportunity is an interesting adaptation to trauma, produced by evolution during phylogenesis of Primate's Anterior Autopod towards the human carpus

Infact, according to Biarticular Concentric Carpal Mechanism (BCCM) (LINSCHIED ET AL., 1972; ALLIEU ET AL., 1982; GRIPPI, 1997; GRIPPI & POMPILIO, 2002), the carpus is assimilated to a bi-articular hip prosthesis that, in the small prosthetic head - reproduced from Capitate - has its center of rotation (CR) (Fig. 2). Using this similitude, at the center of the carpus is identified the “ball and socket” joint of Coxa Manus (CM), the “true” primitive carpal joint, where takes place the s.c. “dart-throwing motion”.

Disconnection of Coxa Manus causes, or rather “IS” the Carpal Instability. Certified by the patognomonic sign of the static or dynamic dislocation of capitate's head with rotation of the carpal center (Fig. 3).

In the evolution and brachiation of Primates, the human bi-articular carpal joint comes from the Reptiles uni-carpal joint, with an onto-phylogenetic development for which the radio-carpal appears after the mid-carpal joint (GRIPPI, 2008). So that, in wrist is possible to distinguish two parts: a distal, ancient: the Paleo-Carpus, represented by couple capitate-hamate, that in the Coxa Manus has retained the privilege of mechanic carpal center; the other proximal, recent: the Neo-Carpus, represented by the proximal carpal row that contains, stabilizes and protects the Coxa Manus (Fig. 4) (GRIPPI, 2015).

In generic radio-carpal injury of s.c. Adaptive Carpus (AC) there is a spontaneous decay of bi-articular towards uni-articular function, basically centered on Coxa Manus and its “dart-throwing motion” (GRIPPI & CUGOLA, 2011). This patho-mechanics (resurrecting the ancestral Paleo-Carpus leadership) is a potential stereotype in any anatomical alteration (congenital or acquired) of Neo-Carpus: then, emerging in the outcomes of distal radius fractures, in Madelung, in Kienböck, in SNAC-SLAC-SCAC wrist, etc. In the same way - to recover problematic radio-carpal injures - a valid surgical option is to concentrate the whole movement of carpus on capitate's head. That is, on Paleo-Carpus. This concept is the s.c. “Grail of Wrist Surgery” the application of which has led to the Coxa Manus Surgery (GRIPPI, 2015).

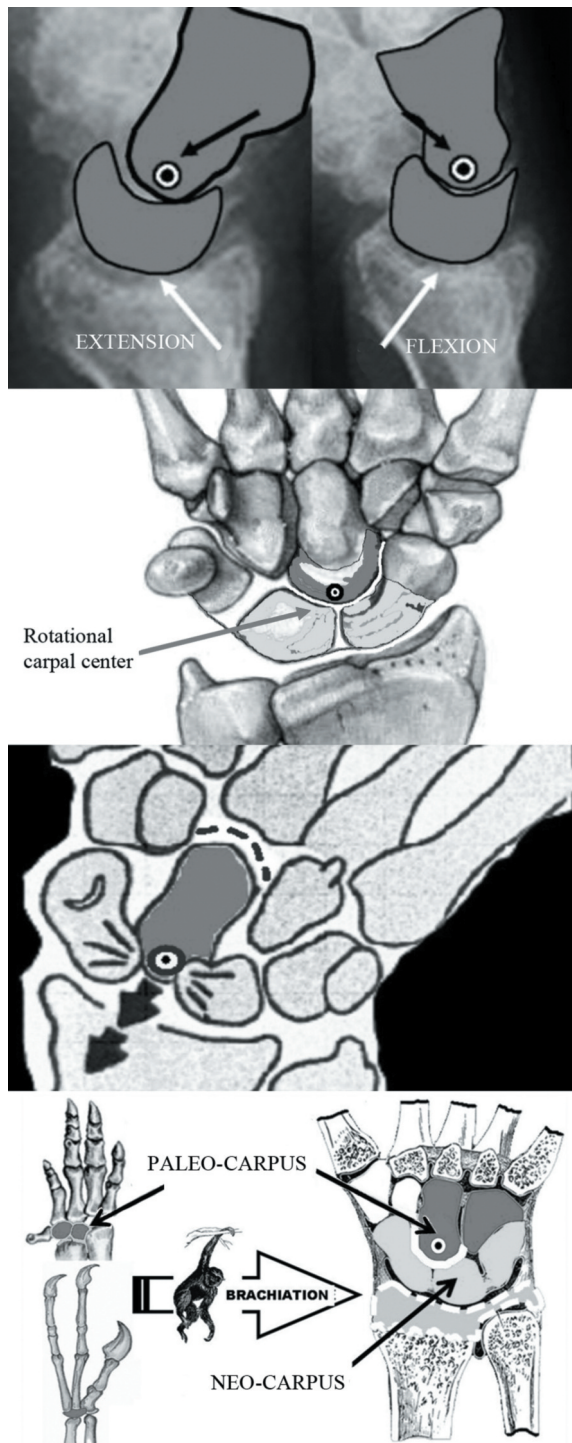


Figure 1. Carpal kinetics. Figure 2. Rotational carpal center of the Coxa Manus. Figure 3. Dislocation of capitate's head. Figure 4. Paleo-carpus and Neo-carpus. In the ancient Reptiles (left): uni-articular carpal joint; Primates and Human (right) with the bi-articular carpal joint.

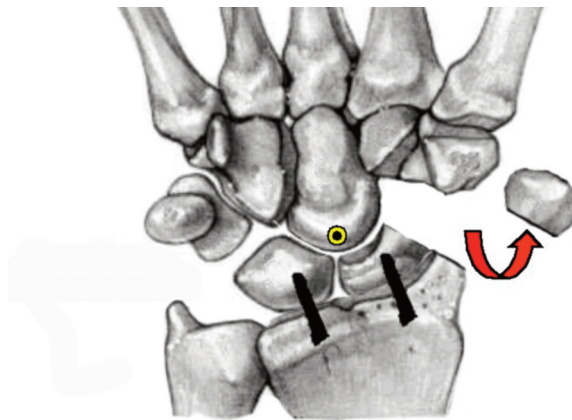


Figure 5. Coxa Manus Reconstruction (see in the text).

MATERIAL AND METHODS

The Coxa Manus Reconstruction (CMR) - particularly useful and versatile - consists in a volar radius-lunate-(hemi-scaphoid) arthrodesis with scaphoid distal resection (Fig. 5). The operation optimizes the physiological adaptation from bi-articular towards uni-articular function, implicit in Adaptive Carpus. In this way, the capitate's head is centred and provided with a new stable support and a full dart throwing motion. The first CMR we did was in June 2000, in a SNAC Wrist (GRIPPI, 2003).

USE OF COXA MANUS RECONSTRUCTION (CMR) IN THE OUTCOMES OF DISTAL RADIUS FRACTURES

The CMR eliminates movement in the radio-carpic damaged joint and amplifies movement in the mid-carpic unscathed joint. The intervention is specifically indicated in cases of chronic pain and/or stiffness preventing the useful function (ie, less than 45° of extension, 30° of flexion, 15° of ulnar and/or radial deviation and 50° of ulnar and/or radial pronation and/or supination). It is performed by volar access, to prevent unwanted dorsal capsular retraction; it requires integrity of capitate's head and it is related to better recovery (up to 80%) of the flexion-extension or ulnar and/or radial deviation.

In some complicated outcomes including also limitation of pronation and supination and/or ulnocarpal conflict, it may be necessary to associate the Sauvé-Kapandj procedure (or other lysis interventions) and/or corrective osteotomy of the radio in the even-

tual presence of axial deformity. In the present brief note 19 operated cases are reported, four of which are shown in details to exemplify either medical indications or clinical outcome.

Case 1

Right rigid wrist in C2 fracture dislocation outcomes (Fig. 6). The X-rays control 11 months after the RCM shows good carpal realignment (Fig. 7).

Case 2

Right wrist of a forty year old baker with B3 fracture and volar subluxation outcomes (Fig. 8). The X-rays control 12 months after the RCM (performed by a volar plate) shows good carpal realignment (Fig. 9).

Case 3

Right rigid wrist in malunion fractures of distal radius-ulna (Fig. 10). X-rays control fourteen months after corrective radius osteotomy (to solve the varus),

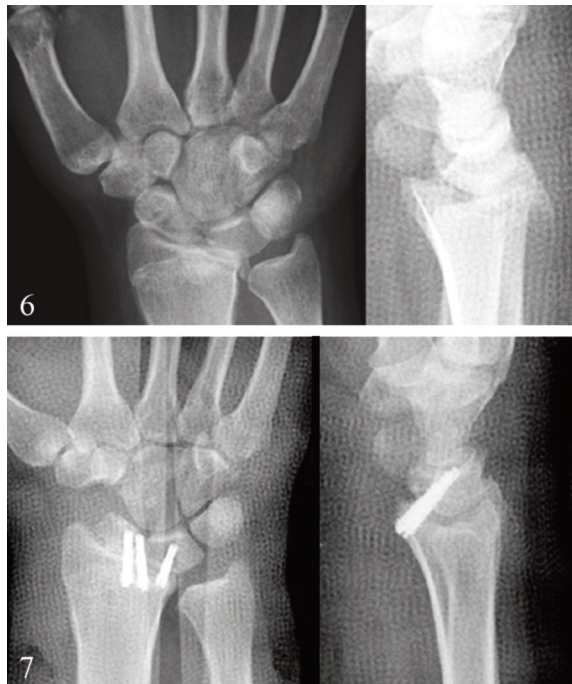
Sauvé Kapandj procedures (to solve pronosupination) and Coxa Manus Reconstruction (performed with the use of screws and volar plate) shows the excellent realignment of the carpus and implant stability (Fig. 11). Clinical assessment clearly shows the excellent recovery of the global range of wrist motion (GRIPPI ET AL., 2013).

Case 4

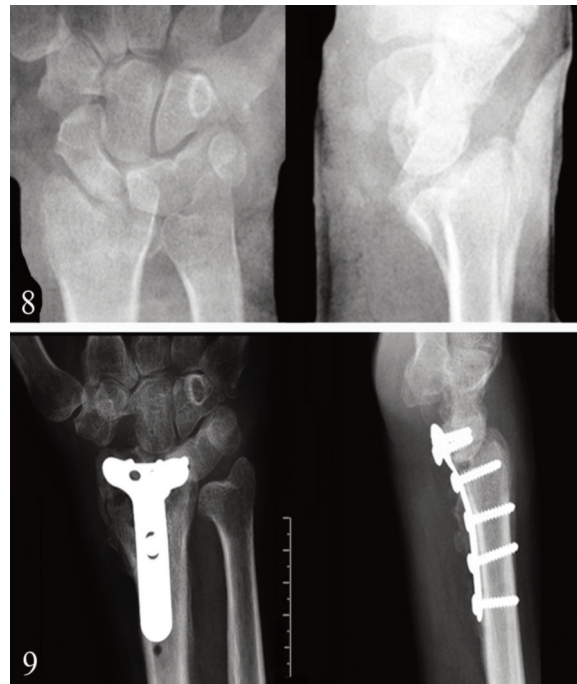
Rarely, when it is not possible to reconstruct the radiocarpal articular surface, the CMR can be performed immediately. As is the case in this comminuted fracture (Fig. 12). To ensure the best stability and early mobilization have been used screws and volar plate, with excellent outcome (Fig. 13).

RESULTS

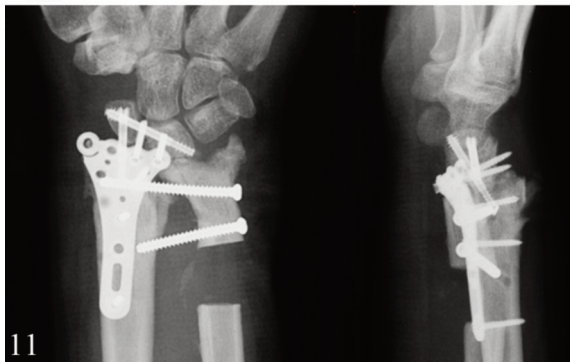
From 2002 to 2015 we treated by CMR 19 wrists with DRF outcomes. The results (assessed according to the parameters of the Mayo Wrist Score Chart, with an average follow-up of 4.8 years) have been satisfactory in 90% of cases.



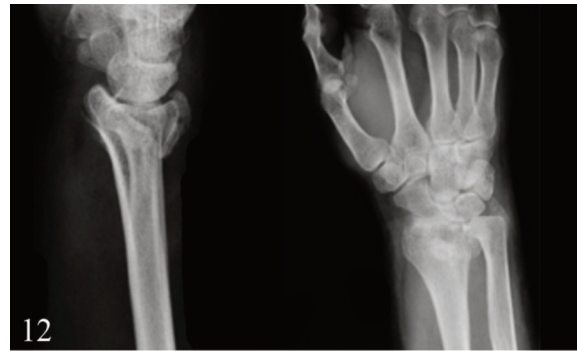
Figures 6, 7. Case 1: see in the text.



Figures 8, 9. Case 2: see in the text.



Figures 10, 11. Case 3: see in the text.



Figures 12, 13. Case 4: see in the text.

CONCLUSIONS

In suffering post-DRF wrist, the CMR has proved to be a valid salvage operation, able to perfect Nature's carpus adaptation in the trauma, with reliable and satisfactory results.

REFERENCES

- ALLIEU Y., BRAHIN B. & ASCENCIO G., 1982. Carpal instabilities: Radiological and clinic-pathological classification. *Annales de Radiologie*, 25: 275–287.
- GRIPPI G.M., 1997. Cinematica del condilo carpale con introduzione al Modello Carpale Biarticolare Concentrico (MBC) e sua applicazione al problema dell'instabilità carpale. *Rivista di Chirurgia e Riabilitazione della Mano e Arto Superiore*, 34: 389–401.
- GRIPPI G.M., 2003. La ricostruzione della "Coxa Manus" Indicazioni e tecnica chirurgica. *Rivista di Chirurgia della Mano*, 40 (3).
- GRIPPI G.M., 2008. Patomeccanica "regressiva" delle fratture articolari del radio distale e salvataggio con l'intervento di Ricostruzione della Coxa Manus. *Minerva Ortopedica e Traumatologica*, 59: 283–298.
- GRIPPI G.M., 2015. Biarticular Concentric Carpal Mechanics and Coxa Manus Surgery. *Proceedings of the 9th Triennial Hand and Wrist Biomechanics International (HWBI) Symposium Milan, Italy, June 16–17*.
- GRIPPI G.M. & CUGOLA L., 2011. Carpo adattativo e trattamento con la chirurgia della Coxa Manus. *Rivista di Chirurgia della Mano*, 48: 93–97.
- GRIPPI G.M. & POMPILIO D., 2002. Surgery in the Outcomes of Traumatic Wrist: Coxa Manus Surgery: Proceedings of 8 th Congress of the Federation of the European Societies for Surgery of the Hand. Amsterdam, May 22–25, 2002. Editor Steven Hovius by Monduzzi Bologna, 57–64.
- GRIPPI G.M., CUGOLA L., D'ARIENZO M. & PASSARETTI U., 2013. Prassi di Chirurgia della mano. *Rivista di Chirurgia della Mano*, 50: 91–100.
- LINSCHIED R.L., DOBYNS J.H., BEABOUT J.W. & BRYAN R.S., 1972. Traumatic Instability of the wrist. Diagnosis, Classification, and Pathomechanics. *Journal of Bone and Joint Surgery*, 54-A: 1612–1632.