Proceedings of the 9th Triennial Hand and Wrist Biomechanics International (HWBI)
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Biarticular Concentric Carpal Mechanics and Coxa Manus Surgery

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INTRODUCTION: Concept and surgical applications of Biarticular Concentric Carpal Mechanics (BCCM) is discussed. This assimilates the carpus to a bi-articular hip prosthesis that, in the small prosthetic head - reproduced from Capitate - has the center of rotation (CR) **(Fig. 1)**.

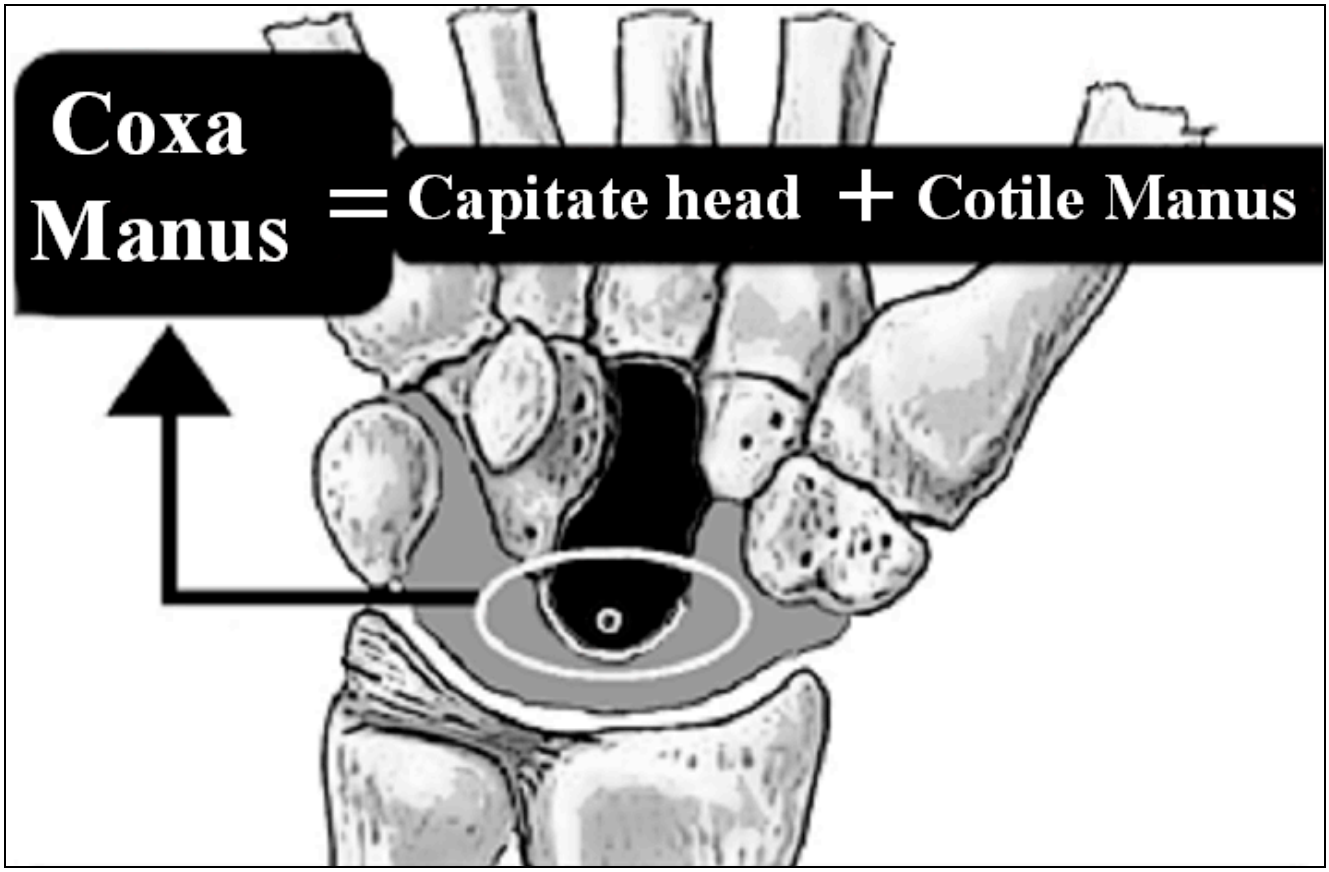

Fig. 1 - The Coxa Manus Concept

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-trowing motion” and whose disjointedness causes Carpal Instability, certified by the static or dinamic dislocation of capitate’s head (**Fig.2**).

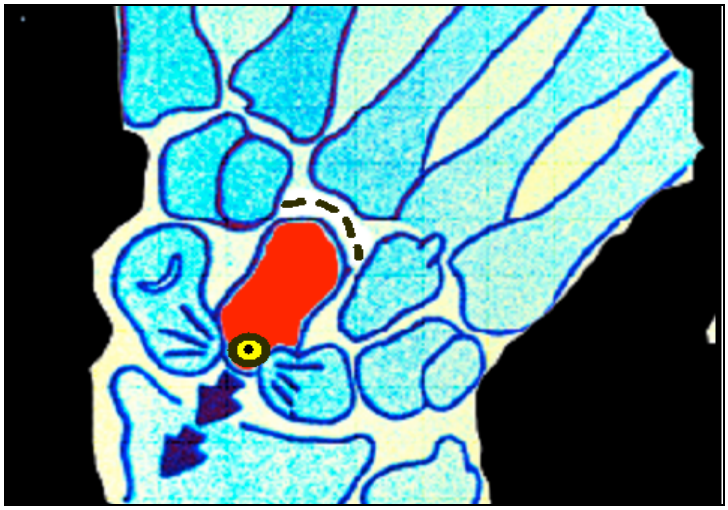

Fig. 2 - Coxa Manus disjointedness causes - or, even better "is" - Carpal Instability

The Human bi-articular carpal joint comes from the Reptiles uni-carpal joint, with an onto-philogenetic development for which the radio-carpal appears after the mid-carpal joint. So that, in wrist is possible to distinguish two parts: a distal, ancient: the Paleo-Carpus, represented by couple capitate-hamate; the other proximal, recently: the Neo-Carpus, represented by the distal row (**Fig.3**).

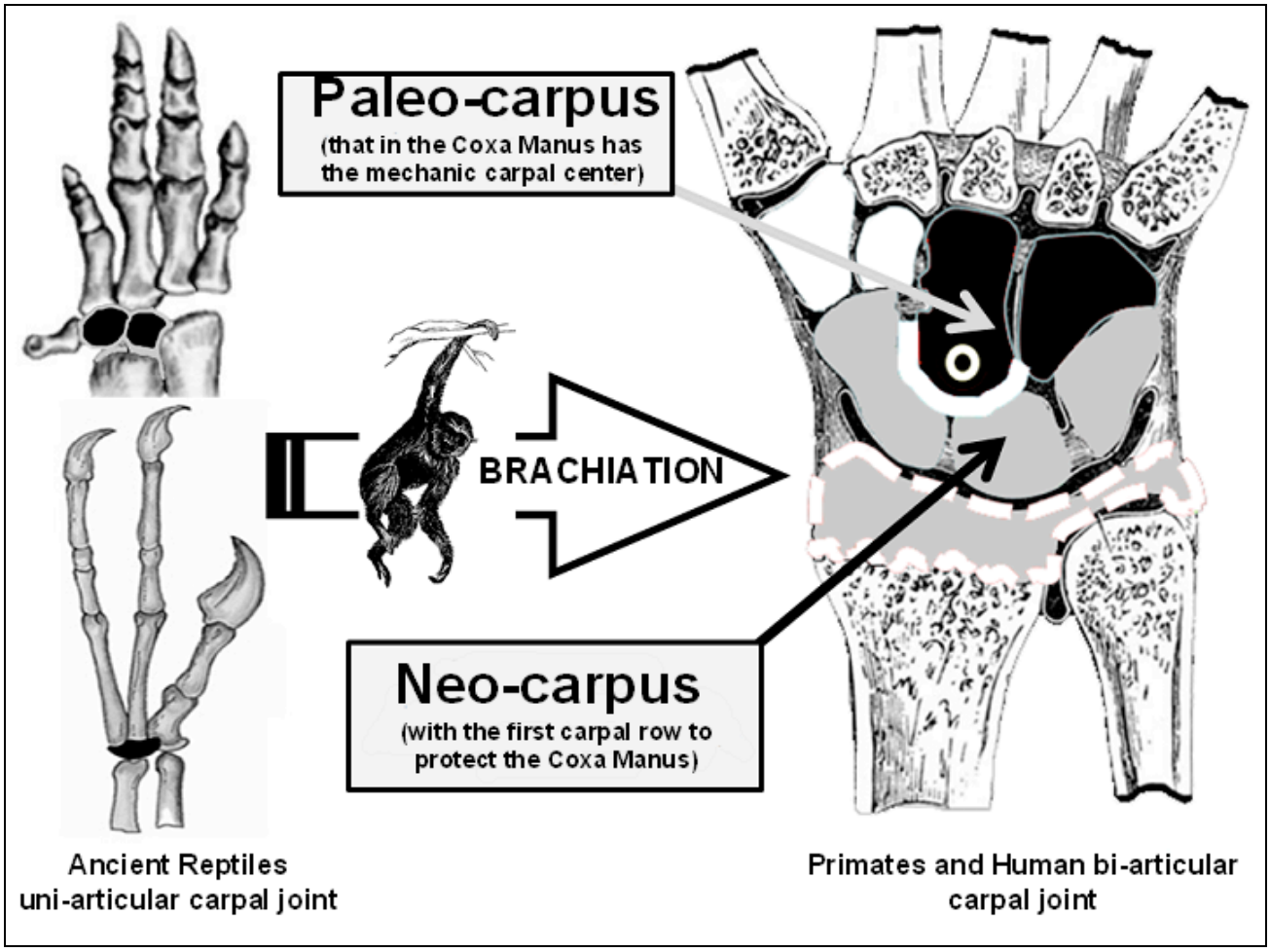

Fig. 3 - Neocarpus and Paleocarpus

METHODS. In generic radio-carpal injury of s.c. Adaptive Carpus (AC) is spontaneus decay of bi-articular towards uni-articular function, basically centred on Coxa Manus and its "dart-trowing motion". This patho-mechanics (resurrecting the ancestral Paleo-Carpus leadership) is 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 - valid surgical option is to concentrate all movement on capitate' head. This concept is the s.c. "Grail of wrist surgery" and has produced the Coxa Manus Surgery methodology **(Fig. 4**)

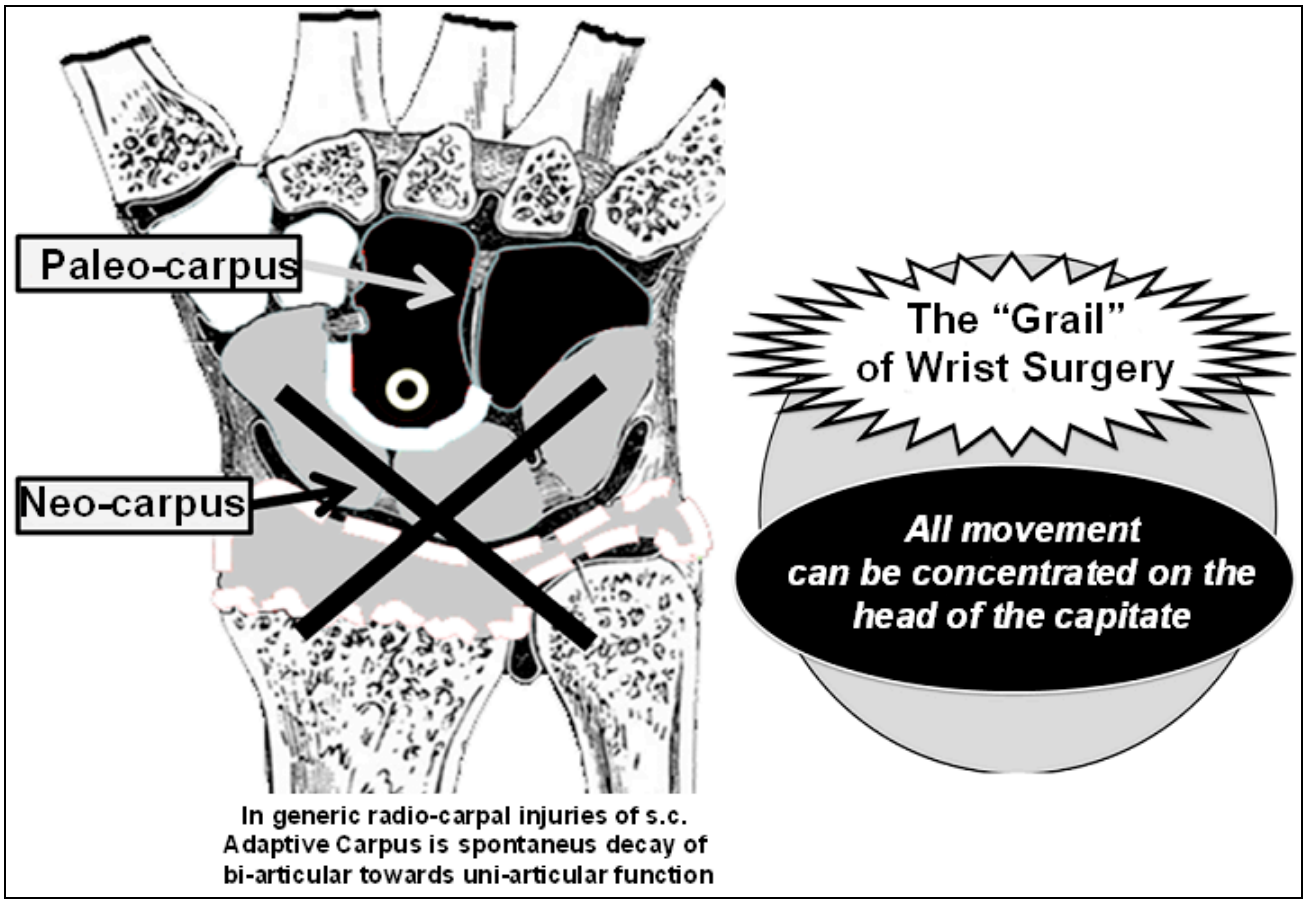

Fig. 4 - Adaptive Carpus and Grail of Wrist Surgery

Particularly useful and versatile is the Reconstruction of Coxa Manus that consists in a volar radius-lunate-(hemi-scaphoid) arthrodesis (with scaphoid distal resection). The intervention optimizes the physiological adaptation by 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 (Fig. **5, 6**).

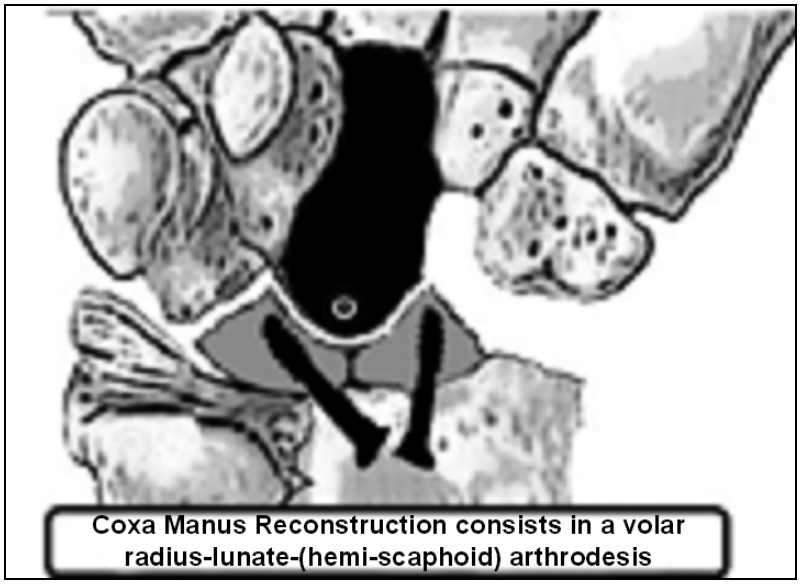

Fig. 5 - Coxa Manus Reconstruction

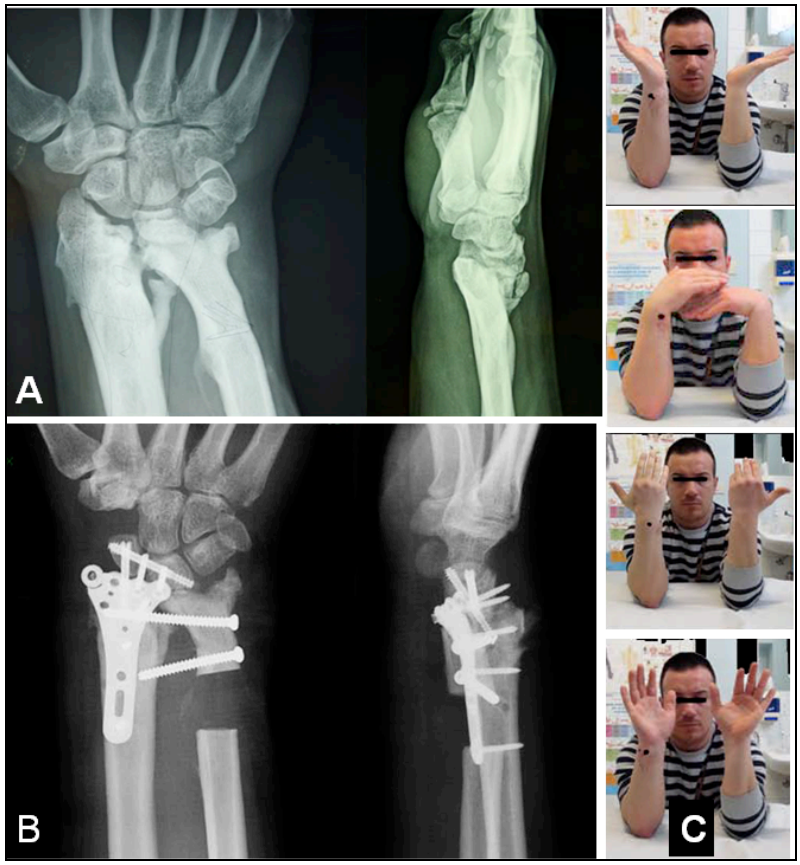

Fig. 6 - Coxa Manus Reconstruction and* Sauve-Kapandji procedure *in Adaptive Carpus outcome distal radius fracture malunion (pre and post operative surgery

Other surgical applications originate from the ascertainment that the resection of the first carpal row (RFCR) is an excellent operation, because the bony demolition, so apparently serious, is a meniscectomy, after all. After this operation the axis of the hand and the axis of the radio-ulnar

carpal joint continue to converge in the head of the capitate where, under lee of the dimple of lunate, they constitute a new carpal rotation centre. But, RFCR is contraindicate if the dimple of lunate or the head of the capitate have been damaged. In this cases to overcome the obstacle can be carried out the Substitutive Center-carpic Resection consisting in the RFCR associated with capitate prosthesis (**Fig. 7**).

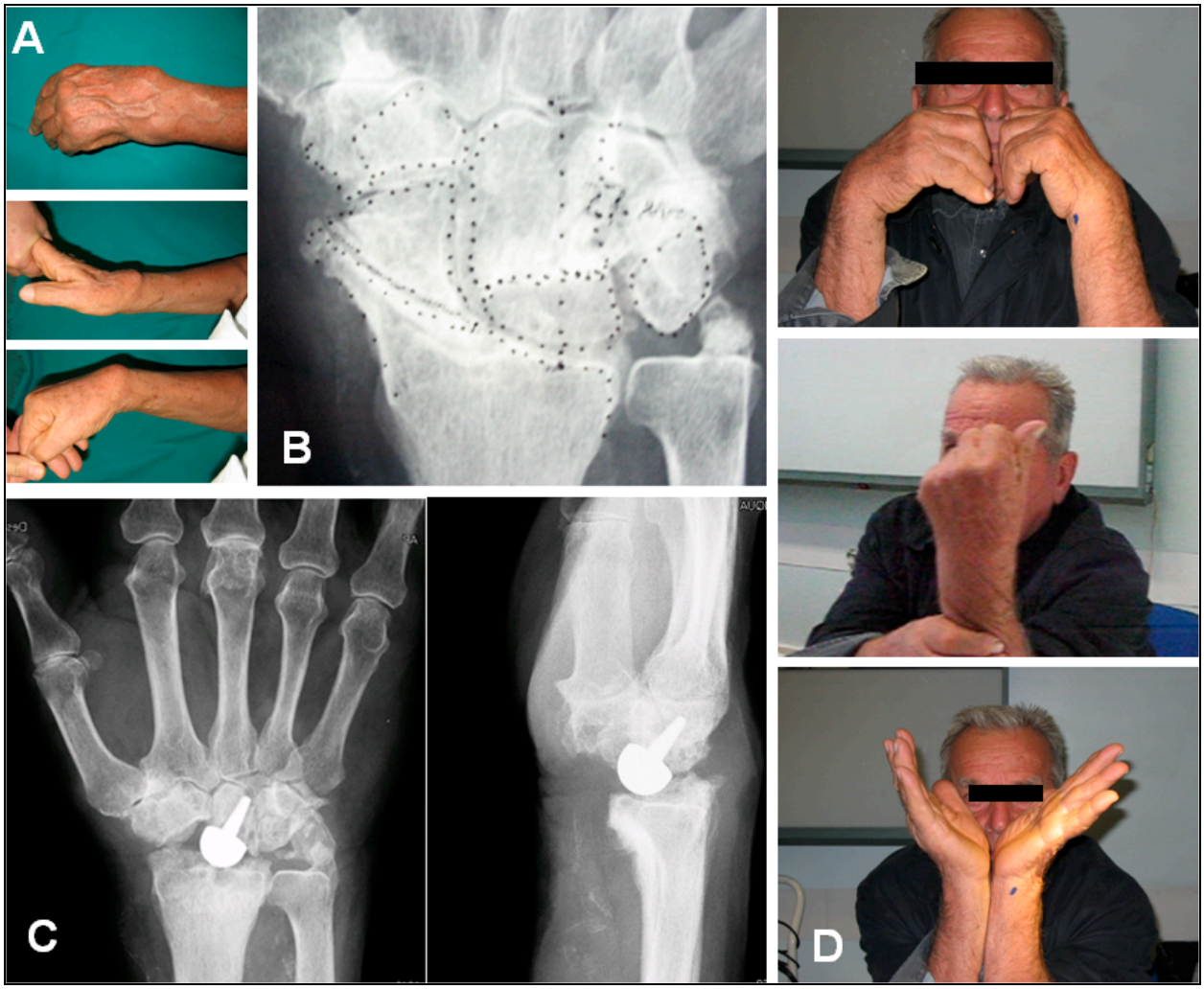

Fig. 7 – Substitute Center-carpic Resection in an advanced carpal collapse (pre and post operative surgery)

RESULTS In support are presented 102 operated cases from 1997 to 2014. The results, (assessed according to the parameters of the Mayo Wrist Score Chart, with 6,5 years average follow-up) have been satisfactory in over 80 percent of patients.

DISCUSSION. We believe that BMMC has re-built the knowledge of wrist physiology with a new and simple biomechanical concept. Beginning in 1997 from these concepts we have projected and carried out the Coxa Manus Surgery that has given and proved good results. This, certainly could be an interesting and fecund future field of wrist surgery.

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