

# **'In Search of Carpal Stability'**

## **The BSSH Stack Fellowship Report 2014-5**

Prepared by

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## **Abstract**

The Stack Travelling Fellowship was introduced by the BSSH to recognise achievement and contribution to the development in hand surgery in the UK. It is awarded to enable pursuit of higher learning and advance the principles of scholarship by improving the care of the hand and foster international relationships. I travelled to five centres of excellence in three continents and attended two international meetings during 2014 and 2015 to pursue my subspecialist interests in carpal instability, sports injuries and arthroscopy of the hand and wrist. Carpal instability remains one of the last unsolved mysteries of the wrist with controversy over management and ever evolving biomechanical concepts. My visits to leaders and leading centres of wrist surgery have both challenged my understanding and fashioned my approach to the management of wrist disorders. This report outlines my travel itinerary and some of the lessons learnt.

**Key Words:** carpal instability, scaphoid non-union, Stack, travelling fellowship, wrist arthroscopy,

## **Introduction**

The Stack Travelling Fellowship was introduced by the BSSH in 2006 in memory of Graham Stack and to recognise achievement and contribution to the development in hand surgery in the UK. As the BSSH's most prestigious bursary, an honorarium of £12,000 is awarded to enable pursuit of higher learning and advance the principles of scholarship by improving the care of the hand and foster international relationships.

It was a great honour to become the fourth recipient of the award, enabling me to pursue my subspecialist interests in carpal instability, sports injuries and arthroscopy of the hand and wrist. My visits to leaders and leading centres of wrist surgery have both challenged my understanding and fashioned my approach to the management of wrist disorders. This report outlines my travel itinerary and some of the lessons learnt.

### **1. Institut Kaplan, Barcelona**

The first leg of my tour was to the world renowned Institut Kaplan in the beautiful city of Barcelona. The institute was founded in 1993 and has been synonymous for the study of the wrist. Professor Marc Garcia-Elias (Figure 1) and Dr Angel Ferreres were my generous hosts. Professor Garcia-Elias has dedicated his career to the understanding of the carpus. It was invaluable to be able to observe first hand his surgical techniques in theatre. For management of STT arthritis, Professor Garcia-Elias demonstrated an elegant technique of scaphoid distal pole excision with tendon anchovy and imbrication of palmar radioscaphocapitate ligament. This is designed to counter the dreaded complication of scaphoid extension and dorsal mid-carpal instability (Garcia-Elias, 2011). With respect to basilar thumb osteoarthritis, Professor Garcia-Elias performs a modification of the Weilby sling following trapeziectomy, this was an easy to follow technique. The FCR tendon is fashioned into a triple figure-of-eight configuration to mitigate first metacarpal subsidence with good results (Garcia-Elias and Tandioy-Delgado, 2014).

It was an honour for me to attend with him, his laboratory in the University of Barcelona and observe the meticulous biomechanical experiments he has been performing with his specially designed jig to study inter-carpal biomechanics. Through his work a greater understanding of the role of the muscles crossing the carpus has been gleaned. The commonly understood function of the FCR tendon in stabilising the scaphoid by an extension moment has been challenged (Salva-Coll et al., 2011) as well as the proposed protective effect of the dart-throwing motion on the dissociated scapholunate joint (Garcia-Elias et al., 2014). The team continue to strive to try and unravel the complex system of ligamentomuscular reflexes of the carpus and study the effect of tendon contraction and inter-carpal ligament resection upon the alignment of the carpal bones. There is a great emphasis on teaching at the Kaplan. Along with the fellows, I was treated to a tutorial on the protective effects on carpal stability of the six antipronation wrist ligaments, their spiral configuration and how, when their integrity is violated, they can be reconstructed by a strip of flexor carpi radialis. The concept and technique of the flexor carpi radialis antipronation spiral tenodesis has been described by Chee et al. (2012).

## **2. Institut de la Main, Paris**

Institute de la Main was founded by Raoul Tubiana in 1972 and has had a long tradition of excellence in the care of the hand. I had come to observe Professor Christof Mathoulin (Figure 2) who has been instrumental in popularising wrist arthroscopy around the world, founding the European wrist arthroscopy society (EWAS) in 2005. EWAS has helped train hundreds of hand surgeons in wrist arthroscopy across the world with established centres of training from Brazil to Taiwan. Mathoulin's team has published on the concept and anatomy of the dorsal capsule-scapholunate septum and its role as a secondary stabiliser of the scapholunate joint (Overstraeten et al., 2013). They have found impressive results in managing chronic non-arthritis scapholunate ligament dissociation by arthroscopic dorsal capsule-ligamentous repair, publishing a series of 57 patients (Wahegaonkar and Mathoulin, 2013). I was fortunate to see him perform three such cases on high performance athletes during my visit and observe his mastery of wrist arthroscopy. He certainly made the technique look straight forward. Professor Mathoulin was generous with his time despite being the main organiser of the FESSH conference the week after my visit. During my stay I also had the opportunity to visit Dr Caroline Leclercq and observe her substantial work in spasticity.

## **3. FESSH Paris 2014**

This was an excellent meeting with a highly structured instructional course running throughout the programme focused on the articular injury of the wrist. Highlights for me included Andrea Atzei's updates on the Iceberg concept of TFC function, a new classification of TFC tears and their arthroscopic management (Atzei et al., 2014).

## **4. Loyola University Hand Unit, Chicago**

My USA tour began in Chicago at the fast paced Loyola University Hand Unit. Chicago is a vibrant city that is home to the ASSH headquarters. I was looked after by departmental head, past ASSH president Professor Terry Light who has an interest in congenital hand surgery and I am indebted to him for his daily hospitality showing me around the city, its fascinating architecture and sharing his love of live Chicago jazz. I spent the majority of my clinical time with Professor Randy Bindra who has an interest in wrist trauma. I was exposed to a high volume of complex hand and wrist trauma reconstruction as well as small joint arthroscopy. Professor Bindra took me through his preferred technique of volar wedge grafting for a case of chronic scaphoid non-union with significant collapse. The technique demonstrated was easy to follow, with some useful tips and tricks which he has clearly outlined in print (Bindra et al., 2008). I found particularly interesting his technique of arthroscopic debridement and interposition of porcine acellular dermis in the thumb CMCJ of a lady in her 30's. Technically, it was certainly made to look fairly easy. Early results in this young patient group have been promising with only one of his 8 patients going on to have revision trapeziectomy.

## **5. The Mayo Clinic, Rochester, Minnesota**

The Mayo Hand Unit has long been synonymous with research and pioneering surgery. I had an added interest in visiting, coming from Salford Royal Foundation Trust, Manchester as this is where the Mayo family emigrated from to go on and found the world renowned clinic. The Mayo family's church is adjacent to my hospital. The Clinic is certainly a most impressive institution with apparent limitless clinical and research facilities. I was warmly received by all the faculty and enjoyed hospitality, discourse, clinic and theatre visits with Professors Richard Berger, Allen Bishop, Steve Moran, Alex Shin, Marco Rizzo, Sanj Kakar and Bassem Elhassan.

It was a real privilege to observe a free medial femoral condyle (MFC) osteochondral graft used to replace the proximal pole of a scaphoid for a patient with Preiser's disease. The procedure was assisted by use of 3D printing technology to allow more accurate harvesting of the osteochondral graft from the femoral condyle and more accurate resection of the diseased scaphoid (Figure 4). The team have now done 8 cases of free osteochondral MFC for scaphoid and lunate pole replacement, 6 of them using 3D printing technology. The 3D technique appears to be an excellent manner to understand the complex anatomy and has helped with the technical aspects. The early results of their series are being critically evaluated at this time.

It was also fascinating to observe Dr Sanj Kakar perform a 360 spiral antipronation tenodesis technique for chronic non-arthritis scapholunate dissociation. In this technique, which is a continuation of the 3LT Brunelli modification, as described by Marc Garcia-Elias, the flexor carpi radialis strip is taken beyond the lunate, passed from dorsal to volar through the triquetrum and back across the volar aspect of the proximal row to be attached back to its distal insertion. This is done to address the volar aspect of the scapholunate ligament which is becoming understood to also have a significant role in scapholunate stability. The results of this technique are being evaluated.

I am very grateful to the entire department for being excellent hosts throughout my stay.

## **6. ASSH Boston 2014**

As a joint travelling BSSH Stack and International travelling ASSH fellow it was an honour to both present to the congress and be personally received by President Scott Kozin at what was an outstanding meeting. This was my first ASSH meeting and I would thoroughly recommend attendance. Meetings are delivered on a huge scale and offer a mixture of didactic seminars, small group tutorials, and instructional courses, including cadaveric workshops. I particularly enjoyed instructional courses on scaphoid non-union and scapholunate instability. The ASSH had spared no expense to bring together experts past and present from around the world under one roof to vigorously debate developments and controversies in the management of these challenging conditions.

## **7. Chinese University of Hong Kong**

The final leg of my tour was to visit Professor PC Ho and his very talented team at the Hand Unit of the Chinese University of Hong Kong. Professor Ho has a minimally invasive philosophy to his practice and has been doing wrist arthroscopy for more than 22 years. As part of an intense tour I observed Professor Ho performing scaphoid non-union bone grafting, scapholunate ligament reconstruction, mid-carpal fusion and DRUJ ligament reconstruction all via arthroscopy. His surgical techniques and skills were hugely impressive for these complex procedures. All four of these techniques, with accompanying case series have been published. I had the benefit of meeting and examining patients in clinic who had had these procedures performed previously, all of which were universally pain free and happy. His results for arthroscopic scaphoid non-union are worthy of note, achieved through 3 to 4 portals and allowing for early return to function with very good range of motion (Wong and Ho, 2011). Conceptually, fixing a scaphoid fracture or non-union with little or no disruption to the scaphoid soft tissues seemed very appealing and provided a diametrically opposing contrast to the free vascularised bone grafting techniques I witnessed elsewhere on my travels.

The arthroscopic assisted combined dorsal and volar scapholunate ligament reconstruction addresses both the dorsal and volar aspects of the scapholunate ligament and has shown good results in his 10 year series. The technique is technically demanding but conceptually is simple, with a box ligament reconstruction using tendon graft fashioned between the scaphoid and lunate, it has been described recently (Ho et al., 2015).

No less challenging was the arthroscopic assisted distal radioulnar ligament reconstruction for chronic DRUJ instability, which was a superb technical feat to watch. Again impressive results have been published with a 10 year series (Tse et al., 2013)

As well as arthroscopic surgery, Professor Ho has a congenital practice and outside of work plays field hockey in the Hong Kong league as well as playing the harmonica as part of the Hong Kong harmonica orchestra. Despite his commitments he was able to spend quite some time with me during my stay for which I am indebted.

### **Summary**

The carpus is a complex biomechanical unit, the understanding of which continues to challenge and inspire. The management of its pathology also continues to be problematic and controversial. On my travels I met with hugely dedicated clinicians who have the passion and energy to continue to push our understanding of how the carpus works and its modern day treatment. Whilst some techniques have yet to show long term consolidated results they challenged my perception of what is technically possible and underlined the importance of continuing to push boundaries both in how we understand carpal pathology and in terms of what is possible with minimal access surgery. I resolved many queries and personal conflicts and about the wrist during my travels as well as picking up lots of tricks and tips observing my hosts in their clinics and theatres. This was a real privilege and I must thank my hosts for their generosity and allowing my intrusion. I must add that I have ended the journey with perhaps more, new, unresolved questions.

Travelling across several continents brought home to me the diverse nature of pathology and how much our culture influences how we as clinicians provide healthcare. It was interesting to see several different techniques, across 3 continents for the management of chronic scapholunate dissociation. No doubt this is due to the challenging and controversial nature of the management of the condition, but is also impacted by technology, culture and skill mix of various departments.

The travelling fellowship has taught me many things which I have brought back to my practice as well as making many friendships across the globe. I would recommend that all of us consider pushing out of our comfort zone, challenge our own practice and visit other centres to give us wider perspectives and ultimately better our patients.

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of all, I thank my family for their support and patience as I travelled around the globe on what was an incredible adventure visiting contemporary centres of excellence.

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## Figures

**Fig.1 Professor Garcia-Elias and the author in the Institut Kaplan Library**



**Fig. 2 The author with Professor Mathoulin and his colleague Dr Mathilde Gras at the FESSH Congress 2014 Paris**



**Fig. 3** professors Shin and Bishop demonstrate the 3D print models constructed for the free femoral osteo-chondral grafting of the proximal scaphoid.



**Fig 4.** The author with Professor PC Ho with his team Dr Clara Wong and Dr Wing-lim Tse.

