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EDITORIAL

Editorial Letter

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Orthopedic Surgeons and Hand Surgery

The readers may ponder this enigmatic title that deals with orthopedic surgeons and hand surgery. We have chosen particularly to demonstrate how it beautifully describes the magnificence of the orthopedic surgeon's contribution to hand surgery in the past, present, and future. Just a bark is inseparable from a tree, so Orthopedic surgeons are from Hand surgery.

We all must think of hand surgery as we practice it today as a very special gift from the monumental innovations and discoveries of great orthopedic surgeons in the past. Born to a gold rush pioneer, Sterling Bunnel published his first paper on the repair of tendons in the journal, *Surgery, Gynecology, and Obstetrics* in 1918. After 18 resubmissions, this publication happened when he served as the Chief of Surgical Services at an Army base hospital in Beaune, France. The First World War struck, and soon, Bunnel joined the army to witness indiscriminate amputations on the battlefield. This enthused him with a positive impact and continued interest in reconstructive surgery to preserve function for the injured hand. During and after the world war, he wrote extensively on flexor tendon repair, tendon grafting, intrinsic muscles, nerve grafting, rheumatoid arthritis, digital arthroplasty, tendon transfer, metacarpophalangeal capsulectomy, splinting, contractures, radial club hand, and pollicization. With all his past experiences in reconstructive hand surgery, Bunnel published a famous book, *Surgery of the Hand*, in 1944 during World War II. This became the bible of hand surgery and was published in several languages and five editions.

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Bunnel started fellowship training and preliminary surgical education in hand surgery. He traveled all over the United States to teach and demonstrate principles and techniques of hand surgery to surgeons at the nine US army hand centers [1–3]. He believed that Orthopedic surgeons could convert themselves into hand surgeons with the right mindset and fullest potential. Further, he added that extensive knowledge and skill set are essential to treat complex anatomy, which is the hand. The inquisitive mind, incisive scalpel, and inexhaustible nature of orthopedic surgeons resolve unsolved problems in hand surgery. He was the founding father of modern hand surgery and the first president of the American Society for the Surgery of the Hand (ASSH). The embryogenesis of hand surgery evolved from the giant of Orthopedic surgeon *Sterling Bunnel*, whose innovations are truly biological. Barsky, Fowler, Littler, Phalen, Pratt, Graham, Frankelton, Howard, and Hyroop are not just Orthopedic surgeons but carried the legacy of hand surgery from Bunnell.

Guy Pulvertaft, an orthopedic surgeon, started his carrier in Grimsby, a port on the east coast of England with a large fishing fleet, in 1937. In this pre-antibiotic era, he faced frequent flexor tendon injuries from cold and fatigued hands working in the fishing industry. Early amputation was considered the treatment for these injuries to prevent septicemia and death until Guy Pulvertaft radically revolutionized the flexor tendon treatment and saved many lives. He presented various lectures and spoke about his experience of flexor tendon repair techniques and flexor tendon grafts as a strong reconstructive technique which still holds the treatment of choice now. With loads of experiences from the Second World War, he refined his flexor technique that Sterling Bunnel considered his tendon results less good than Pulvertaft. He became the inaugural president of the British Society for Surgery of the Hand in 1968–69 and a master hand surgeon [2].

Dr. Alfred B. Swanson started his Orthopedic carrier during the thalidomide disaster and the great polio epidemic. He focused his attention on reconstructive surgery and rehabilitation for these deformities. Later, he pioneered the concepts

of flexible implants for small joint reconstruction and performed the first-ever biocompatibility studies of silicone in bone. He developed silicon, titanium, and other implants for the shoulder, elbow, wrist, and great toe and authored more than 300 publications in implant reconstruction in hand and extremities. His passion and dedication to hand surgery are well known, especially for his innovative work in developing and applying silicon arthroplasty for finger joint arthritis. Even today, silicon arthroplasty for metacarpophalangeal joint arthritis remains the golden standard of care. Swanson introduced a classification for congenital limb differences and evaluated permanent impairment of hand function [2, 3]. The congenital hand classification formed the prime basis and foundation for many years with rational and inclusive. The main categories of the classification are (I) failure of formation of parts, (II) failure of differentiation (separation) of parts, (III) duplication, (IV) overgrowth, (V) undergrowth, (VI) congenital constriction band syndrome, and (VII) generalized skeletal abnormalities. Recently, International Federation of Society for Surgery of the Hand (IFSSH) modified it further to form uniform guidance for treatment and insight into prognosis incorporating the etiological mechanism of the congenital upper limb conditions.

Dr. Paul W Brand completed his surgical training in 1946 in London. He came to Christian Medical College, Vellore, India. He found no literature on the Orthopedics aspects of leprosy and surgical reconstruction for limb deformities that piqued his curiosity. His insightful and innovative thinking with a rational approach to correcting the deformities in hands and feet is still followed in all parts of the world. The book "Clinical mechanics of the hand" is one of his significant contributions to understanding the hand, principles of reconstruction, and rehabilitation. He pioneered various tendon transfers and nerve reconstruction to overcome the paralysis of the intrinsics and restore mobility in claw hands. Sooner, George Anderson, Dinkar D Palande, and H. Srinivasan contributed notably to reconstructive hand surgery.

In 1970, India witnessed a pioneer and ingenuity of hand surgery, Prof Brij Bhushan. Joshi, the first qualified Orthopedic Surgeon. His innovations included eight different types of sensate flaps for mutilated hand injuries. Interestingly, he designed these flaps for blind patients to provide them the eyes with the finger's tactile sensation. Joshi's External Stabilization System (JESS) was his greatest innovation used to treat crushed and mangled hand and foot injuries. It is one of the most used instruments in India. Thanks to his workshops and training modules which were passed on to the next generations by his students.

Additionally, the JESS effectively corrected the congenital deformities of the hand (radial club hand) and foot (congenital talipes equino varus) [4]. Realizing the importance of aftercare in hand surgery, he devised elegant indigenous splints that are affordable and available from common materials (Rexene strips, Aluminum, rubber hose pipes, and spring wires). This reminds the quality of the orthopedics surgeon's diligence, commitment, and endurance to the care of the injured hand.

There is no such fracture that evolved and keeps evolving now—distal radius fractures. Hippocrates (ca 400 BC) first described a distal radius fracture, considered a wrist dislocation until the nineteenth century. Literature has documented various treatment modalities with casting and splints made up of wood, bamboo, egg white, solidifying pastes, starch, tight bandages, and gypsum until the first use of plaster in the early nineteenth century when treating physicians effectively understood fracture management. Sooner, Hugh Owen Thomas and Robert jones, the fathers of British Orthopedics, invented the tin splints for distal radius fractures because of the constriction effects of the tight plaster of paris reducing the local circulation. Albert Ibrahim Kapandji (1928–2019), a French Orthopedic Surgeon, revolutionized the concept of intrafocal pinning for distal fracture and distal radioulnar joint instabilities. James Ellis, an Orthopedic Surgeon, first used a volar T-buttress plate to treat Smith's and Barton's Fractures and laid the way for further advancement and innovations to internal fixation of distal radius fractures [5].

Significant contributions to wrist arthroscopy, a unique surgical procedure to resolve biomechanically complex and intricate wrist ailments, were unfolded by orthopedic surgeons who were the knees of experts: Leonard Goldner, James Urbaniak, James Dobyns, Ronald Linscheild, Julio Taleisnik, Lee Osterman, Richard Berger, and Terry Whipple. Soon innovations, modifications, and technical advancements happened. In 1989, Andy K Palmer classified both traumatic and degenerative lesions based on the locations, severity, and involvement of the ulnar head, ulnocarpal bones, and lunotriquetral ligament. Marc Garcia-Elias revolutionized the understanding of wrist mechanics and carpal instability and significantly contributed to managing carpal dysfunctions [3]. In recent times, Christophe Mathoulin, Toshiyasu Nakamura, Riccardo Luchetti, Francisco del Pinal, and PC Ho have significantly refined wrist arthroscopy techniques for examining and treating both common and uncommon disorders of the wrist.

Ronald L Linscheid, James H Dobyns, John W Beabout, and Richard S Bryan introduced the concept of dorsal intercalated instability (DISI) and volar intercalated instability (VISI) in 1972 and defined the basic concepts, diagnosis, and treatment of wrist instability [3]. Jack Mayfield, Roger Johnson, and Raphael Kilcoyne described the pathomechanics, ligamentous damage, and degree of carpal instability in perilunate and lunate dislocations in 1979. Brunelli described the Flexor Carpi Radialis (FCR) tenodesis for scapholunate dissociation. Marc Garcia-Elias modified the Brunelli procedure with a strip of FCR passed through the tunnel in the proximal scaphoid pole

exiting at the scapholunate interval and anchored to the dorsal radiocarpal ligament attachment at the triquetrum [3]. This procedure effectively replicates the scapholunate ligament and provides better control of scaphoid flexion.

Scaphoid fracture has been problematic because of its precarious blood supply and high incidence of nonunion and arthritis. Timothy Herbert developed a unique headless compression screw for the scaphoid for fracture compression and union in 1984. The screws had a variable pitch at either end to promote good compression across the fracture site. Soon, Whipple modified the screw with cannulation, increased the diameter of the unthreaded segment, and self-tapping threads with a more aggressive pitch to increase fracture compression forces [3].

Fracture dislocations of the PIP joint are always challenging to treat, because the inadequate understanding of the fracture morphology and joint mechanics leads to an unsatisfactory outcome. It is troublesome and prone to develop pain, stiffness, chronic instability, and degenerative arthritis. In 1994, Suzuki, an Orthopedic Surgeon from Japan, innovated a simple skeletal traction system for comminuted intraarticular fractures and efficiently achieved a good union of the fracture and range of motion. This technique has significantly impacted hand surgery and is considered one of the reliable treatment methods for PIP joint fracture dislocations [6]. Soon, Richard E. Eaton, an Orthopedic Surgeon from New York, described volar plate arthroplasty for acute and chronic PIP joint fractures' dislocation and associated arthritis in 1980. This procedure provides a volar restrain to maintain the PIP joint reduction while resurfacing the irregular or deficient volar articular surface of the middle phalanx base. Most surgeons today can replicate the principles behind this surgery and achieve good results for their complex PIP joint fracture dislocations. Further, Hasting and his orthopedic colleagues recommended hemi-hamate resurfacing arthroplasty for unstable PIP joint fracture dislocations with articular surface involvement of > 50%. This restored joint congruity and stability and allowed early mobilization, which has brought an incredible difference in managing these complex fracture dislocations.

In 1997, Takashi Ishiguro, an Orthopedic Surgeon from Japan, found an extension block method with Kirschner wire for fracture dislocations of the distal interphalangeal joint. This new reduction technique reduced the mallet deformity, maintained the reduction, and achieved union. This innovative technique is simple and effective even today for all mallet fractures associated with joint subluxation and large articular surfaces.

Shigeo Komatsu and Susumu Tamai were the first to successfully replant a completely cut-off thumb in 4 ½ h in an accidentally amputated thumb. Both Orthopedic surgeons opened opportunities for future microsurgery by converting the experimental aspects of microsurgery to real time and remained the hero's ever in reconstructive microsurgery.

In 1943, Dr. Herbert Seddon, a British Orthopedic Surgeon, advocated the fundamental understanding of nerve surgery by the description of three levels for nerve injury: neuropraxia (disruption injury of the endoneurium), axonotmesis (disruption injury of the mesoneurium), and neurotmesis (disruption injury of the epineurium). Soon, Hanno Millesi revolutionized the treatment of brachial plexus injuries by introducing microsurgery, microsurgical nerve grafting, and interfascicular nerve grafting. Introducing microsurgery, advanced imaging and electrodiagnostic tests, refined nerve transfers and nerve grafting techniques, free functioning muscle transfers, and advances in rehabilitation improved brachial plexus injuries' outcomes.

To recite the countless names of Orthopedic surgeons who have immensely advanced hand surgery would be pedantic and exclusive. We stand on the shoulders of these giants whose contributions are from a mammoth task. We owe a debt for their gift that can never be repaid fully. It is a debt owed to what is considered by many to be the hand surgeons' own "greatest generation".

In the current scenario, a hand surgeon is an amalgamation of three overlapping specialties: neurosurgery, plastic, and orthopedics. The orthopedic surgeon practicing hand surgery has considerable ingenuity to understand the surgical anatomy and biomechanics of the finger joints and controls the composite situation unhampered by several limitations. Additionally, knowledge, energy, technical skills, innovative thinking, and long hard work are the inherited skills of an Orthopedic surgeon. For complete care of the injured hand, the transformation of orthopedic surgeons to treat bone and joints, repair or graft the nerve, reconstruct soft tissues, and provide skin coverage makes them the hand surgeon. The bone–ligament–soft tissue complex is well understood and kept in line by the orthopedic surgeon, who strikes like a pen for an artist. orthopedic surgeons are always well-sung heroes of all times in hand surgery. It is still much for Orthopedic surgeons to learn about the evolving hand surgery. Globally, hand surgery is now a heterogenous field comprising Orthopedic surgeons, plastic and general surgeons with a wide range of skills and significant variability in training. In the United States, the hand surgery call or duty taken by plastic surgeons without hand fellowship training complicated the patient-related outcomes and quality. In a recent study, Higgins et al. observed a trend that represented the departure of plastic surgery from the field and discipline of hand surgery [7].

As in any branch of medicine, including skills in other fields is progressive. orthopedic surgeons practicing hand surgery did the same and collaborated well with plastic and neurosurgeons to improve outcomes. The Indian Society for Surgery of the Hand (ISSH) grew with the same thoughts

allowing membership to diverse experts. The first responder in hand problems would remain to be an orthopedic surgeon. This central role of an orthopedic surgeon should be held hard, again being in the interest of patient care. A concept of basic knowledge of hand in the Orthopedic curriculum needs to be re-emphasized and insisted upon. Advanced care can always be delivered at centers of excellence with collaborative delivery. It is time to awaken to this loss of mindset where hand surgery should not go out of the hands of Orthopedic surgeons.

We hope that some of the discourse of Orthopedic surgeons staying away from this subspecialty or transiently avoiding it will now stimulate the fertile minds of young orthopedic surgeons and others to take up this hand surgery and fill in the gaps in our present understanding and practice of modern hand surgery. Additionally, they need to research and create more innovative techniques to simplify hand surgery. To use a hand surgery metaphor, the future is in the palm of an Orthopedic surgeon's hand.

Declarations

Conflict of Interest The authors declare that they have no conflict of interest.

Ethical Approval This article does not contain any studies with human or animal subjects performed by the any of the authors.

References

1. Green, S. A. (2013). Giants in orthopaedic surgery: Sterling Bunnell MD. *Clinical Orthopaedics and Related Research, 471*(12), 3750–3754. https://doi.org/10.1007/s11999-013-3303-1
2. Cooney, W. P. (2012). The modern history of the wrist. *J Wrist Surg., 1*(2), 95–102.
3. Whipple, T. (2013). How i see the wrist. *J Wrist Surg., 2*(2), 99–104. https://doi.org/10.1055/s-0033-1343736
4. Prabhoo, R., & Garg, B. (2017). Legends of Indian orthopedics: Dr Brij Bhushan Joshi. *Indian J Orthop., 51*(6), 722–723. https://doi.org/10.4103/ortho.IJOrtho_587_17
5. Harness, N. G., & MD; Meals, Roy A MD. (2006). The history of fracture fixation of the hand and wrist. *Clinical Orthopaedics and Related Research, 445*, 19–29.
6. Suzuki, Y., Matsunaga, T., Sato, S., & Yokoi, T. (1994). The pins and rubbers traction system for treatment of comminuted intraarticular fractures and fracture-dislocations in the hand. *J Hand Surg Br., 19*(1), 98–107. https://doi.org/10.1016/0266-7681(94)90059-0
7. Higgins, J. P. (2010). The diminishing presence of plastic surgeons in hand surgery: A critical analysis. *Plastic and Reconstructive Surgery, 125*(1), 248–260.