Editorial

Recent Advances and Developments in Hand Surgery

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In recent years there have been many advances and developments in all orthopaedic disciplines especially Hand surgery. These have been due to our better understanding, and in turn better management of the many congenital deformities, tendon, bony and neural injuries, neuropathies, Dupuytren's disease, and arthroses as well as rehabilitation. All of these important developments are included in our special issue.

Syndactyly is a condition well documented in current literature due to it being the most common congenital hand defect, with a large aesthetic and functional significance. There are currently nine types of phenotypically diverse non-syndromic syndactyly, an increase since the original classification by Temtamy and McKusick (1978). Non-syndromic syndactyly is inherited as an autosomal dominant trait, although the more severe presenting types and sub types appear to have autosomal recessive and in some cases X-linked hereditary. Gene research has found that these phenotypes appear to not only be one gene specific, although having individual localised loci, but dependant on a wide range of genes and subsequent signalling pathways involved in limb formation. The principal genes so far defined to be involved in congenital syndactyly concern mainly the Zone of Polarizing Activity and Shh pathway. Research into the individual phenotypes appears to complicate classification as new genes are found both linked, and not linked, to each malformation. Consequently anatomical, phenotypical and genotypical classifications can be used, but are variable in significance, depending on the audience. Currently, management is surgical, with a technique unchanged for several decades, although future development will hopefully bring alternatives in both earlier diagnosis and gene manipulation for therapy.

Flexor tendon injuries still remain a challenging condition to manage to ensure optimal outcome for the patient. Since the first flexor tendon repair was described by Kirchmayr in 1917, several approaches to flexor tendon injury have enabled successful repairs rates of 70-90%. Primary surgical repair results in better functional outcome compared to secondary repair or tendon graft surgery. Flexor tendon injury repair has been extensively researched and the literature demonstrates successful repair requires minimal gapping at the repair site or interference with tendon vascularity, secure suture knots, smooth junction of tendon end and having sufficient strength for healing. However, the exact surgical approach to achieve success being currently used among surgeons is still controversial. Therefore, in this series we aim to discuss the results of studies demonstrating the current knowledge regarding the optimal approach for flexor tendon repair. Post-operative rehabilitation for flexor tendon surgery is another area, which has caused extensive debate in hand surgery. The trend to more active mobilisation protocols seems to be favoured but further study in this area is needed to find the protocol, which achieves function and gliding but avoids rupture of the tendons. Lastly despite success following surgery complications commonly still occur post surgery, including adhesion formation, tendon rupture and stiffness of the joints. Therefore, we discuss the appropriate management of these difficulties post surgery. New techniques in management of flexor tendon will also be discussed including external laser devices, addition of growth factors and cytokines.

Extensor tendon injuries are common injuries, which inappropriately treated can cause severe lasting impairment for the patient. Assessment and management of flexor tendon injuries has been widely reviewed, unlike extensor injuries. It is clear from the literature that extensor tendon repair should be undertaken immediately but the exact approach depends on the extensor zone. Zone I injuries otherwise known as mallet injuries are often closed and treated with immobilisaton and conservative management where possible. Zone II injuries are again conservatively managed with splinting. Closed Zone III or 'boutonniere' injuries are managed conservatively unless there is evidence of displaced avulsion fractures at the base of the middle phalanx, axial and lateral instability of the PIPJ associated with loss of active or passive extension of the joint or failed non-operative treatment. Open zone III injuries are often treated surgically unless splinting enable the tendons to come

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1874-3250/12 2012 Bentham Open

together. Zone V injuries, are human bites until proven otherwise requires primary tendon repair after irrigation. Zone VI injuries are close to the thin paratendon and thin subcutaneous tissue which strong core type sutures and then splinting should be placed in extension for 4-6 weeks. Complete lacerations to zone IV and VII involve surgical primary repair followed by 6 weeks of splinting in extension. Zone VIII require multiple figure of eight sutures to repair the muscle bellies and static immobilisation of the wrist in 45 degrees of extension. To date there is little literature documenting the quality of repairing extensor tendon injuries however loss of flexion due to extensor tendon shortening, loss of flexion and extension resulting from adhesions and weakened grip can occur after surgery. In our series we aim to provide a systematic examination method for assessing extensor injuries, presentation and management of all type of extensor tendon injuries as well as guidance on mobilisation pre and post surgery.

Hand fractures are the most common fractures presenting at both accident and emergency and within orthopaedic clinics. Appropriate evaluation at first presentation, as well as during their management, can significantly prevent both morbidity and disability to a patient. These decisions are dependant on a wide range of factors including age, hand dominance, occupation and co-morbidities. A fracture is best described as a soft tissue injury with an associated bony injury. In our series we also deal with the bone injury and aims to discuss both the timing, as well as the methods available, of hand fracture management. Intra-articular phalangeal fractures are a common injury. If left untreated, these injuries can lead to poor functional outcome with severe dehabilitating consequences, especially in younger patients. The S-Quattro external fixator device (Surgicraft®, UK) can be used to treat such injuries. Its' use has been widely documented and has shown many advantages in comparison to other conventional treatments. Advantages include reduced operative time, rigid fixation and early range of motion. We present a review of the current literature and use of the S-Quattro serpentine system in the management of intra-articular phalangeal fractures.

Concepts of neuronal damage and repair date back to ancient times. The research in this topic has been growing ever since and numerous nerve repair techniques have evolved throughout the years. Due to our greater understanding of nerve injuries and repair we now distinguish between central and peripheral nervous system. In thisissue, we will also concentrate on peripheral nerve injuries involving the hand. There are no reviews bringing together and summarizing the latest research evidence concerning the most up-to-date techniques used to improve hand function. Therefore, by identifying and evaluating all the published literature in this field, we have summarized all the available information about the advances in peripheral nerve techniques used to improve hand function. The most important ones are the use of resorbable poly[(R)-3-hydroxybutyrate] (PHB), epineural end-to-end suturing, graft repair, nerve transfer, side to side neurorrhaphy and end to side neurorrhaphy between median, radial and ulnar nerves, nerve transplant, nerve repair, external neurolysis and epineural sutures, adjacent neurotization without nerve suturing, Agee endoscopic operation, tourniquet induced anesthesia, toe transfer and meticulous intrinsic repair, free auto nerve grafting, use of distal based neurocutaneous flaps and tubulization. At the same time the patient's age, tension of repair, time of repair, level of injury and scar formation following surgery affect the prognosis. Despite the thorough findings of our systematic review we suggest that further research in this field is needed.

Continuing with the theme of nerves, carpal tunnel syndrome (CTS) remains a puzzling and disabling condition present in 3.8% of the general population. CTS is the most well-known and frequent form of median nerve entrapment, and accounts for 90% of all entrapment neuropathies. In our issue we aim to provide an overview of this common condition, with an emphasis on the pathophysiology involved in CTS. The clinical presentation and risk factors associated with CTS are discussed in this issue. Also, the various methods of diagnosis are explored; including nerve conduction studies, ultrasound, and magnetic resonance imaging.

Dupuytren's disease (DD) is a type of fibromatosis which progressively results in the shortening and thickening of the fibrous tissue of the palmar fascia. This condition which predominantly affects white-northern Europeans has been identified since 1614. DD can affect certain activities of daily living such as face washing, combing hair and putting hand in a glove. The origin of Dupuytren's contracture is still unknown, but there are a number of treatments that doctors have come across throughout the years. Historically surgery has been the mainstay treatment for DD but not the only one. In this issue we provide a structured review of the most recent advances in treatment of DD including the surgical and medical interventions. We have looked at the most relevant published articles regarding the various treatment options for DD. This review has taken 55 articles into consideration which have met the inclusion criteria. The most recent treatments used are multi-needle aponeurotomy, extensive percutaneous aponeurotomy and lipografting, injecting collagenase Clostridium histolyticum, INF-gamma and shockwave therapy as well as radiotherapy. Each of these treatments has certain advantages and drawbacks and cannot be used for every patient. In order to prevent this condition, spending more time and money in the topic is required to reach better and more consistent treatments and ultimately to eradicate this disease.

Recently there has been resurgence in the popularity of percutaneous needle fasciotomy. It is a simple method that uses a hypodermic needle as a scalpel blade. It is usually performed in the out-patient setting under local anaesthesia without a tourniquet. It has few complications and allows almost immediate return to work with few restrictions. It can provide complete deformity correction and may offer a long-term solution in selected patients. It is also useful in converting advanced contractures into milder deformities, allowing a second stage digito-palmar fasciectomy to be more successful. Recurrence is earlier than with more formal and invasive techniques but the procedure can be repeated and does not preclude the patient from further surgery. In our issue we also provide a review of this technique and assesses the efficacy and outcomes of published data.

Rheumatoid arthritis is a systemic autoimmune disease of uncertain aetiology, which is characterized primarily by synovial inflammation with secondary skeletal destructions.

Approximately half a million adults in the United Kingdom suffer from rheumatoid arthritis with an age prevalence between the second and fourth decades of life; annually approximately 20,000 new cases are diagnosed. The management of Rheumatoid Arthritis is complex; in the initial phase of the disease it primarily depends on pharmacological management. With disease progression, surgical input to correct deformity comes to play an increasingly important role. The treatment of this condition is also intimately coupled with input from both the occupational therapists and physiotherapy. We include in our issue a systematic review of these various treatment options.

The dynamometer was developed by American neurologists and came into general use in the late 19^{th} century. It is still used in various ways as a diagnostic and prognostic tool in clinical settings. In our issue we include a systematic review assessing in detail the different uses of dynamometry, its reliability, different dynamometers used and the influence of rater experience by bringing together and evaluating all published literature in this field. It was found that dynamometry is applied in a wide range of medical conditions. Furthermore, the great majority of studies reported acceptable to high reliability of dynamometry. Jamar mechanical dynamometer was used most often in the studies reviewed. There were mixed results concerning the effect of rater experience. The factors influencing the results of dynamometry were identified as age, gender, body weight, grip strength, BMI, non/dominant hand, assessing upper/lower limbs, rater and patient's strength and the distance from the joint where the dynamometer is placed. This review provides an understanding of the relevance and significance of dynamometry which should serve as a starting point to guide its use in hand trauma assessment. On the basis of this review, hand dynamometry has a great potential and could be used more often in clinical practice.

We hope that all physicians, surgeons, therapists and practitioners involved in the care of hand pathologies find this issue useful.