Musculoskeletal Ultrasound of the Adult Hip and Groin – Anatomy and Pathology

Philip Robinson FRCR.
Department of Radiology, Leeds Teaching Hospitals, UK.

TRANSDUCER CHOICE

When assessing the pelvic region for musculoskeletal abnormality examination should always commence with the highest frequency transducer available (>12MHz) followed by interchange to lower frequencies if image quality dictates.

There remain some definite limitations for ultrasound evaluation of musculoskeletal disease in the adult pelvis, but this technique plays an important role in diagnosis, intervention and dynamic evaluation of the region. These talks will review the role of ultrasound in musculoskeletal hip and pelvis disease for diagnosis and intervention.

Summary of main uses:
- Hip effusion and aspiration
- Hernia detection and classification
- Muscle and tendon abnormality
- Guided therapeutic injection

HIP JOINT EFFUSION

Ultrasound evaluation for hip joint effusion is made using an anterior approach parallel to the longitudinal axis of the femoral neck. At the junction of the femoral neck and head the normal capsular margin should follow this bony contour with evaluation looking to assess outward capsular displacement by fluid or other pathology. If fluid is seen its echotexture should be determined as purely hypoechoic (suggesting simple fluid) or complex in nature with internal echoes (suggesting active inflammation or infection). These features should be used to support any underlying clinical diagnosis as ultimately normal or markedly abnormal ultrasound features are not disease specific.

ULTRASOUND GUIDED ASPIRATION AND INJECTION OF THE HIP

Direct needle visualisation requires a needle skin entry site at the margin of the probe and can be performed in either the transverse or longitudinal plane of the femoral neck, although the transverse position is usefully easier to perform.

This technique is preferred for hip injection as it allows confirmation of needle and injectate position. Diagnostic injection procedures include intra-articular local anaesthetic to confirm joint based symptoms and gadolinium solution for MR arthrography. Therapeutic procedures include corticosteroid injection for arthritides, both degenerative and inflammatory. Once the needle is within the joint there should be little resistance to injection with injectate flowing away from the needle tip and no collection around the tip (which if present indicates an extra-articular position).

LABRAL ABNORMALITIES AND FEMEROACETABULAR IMPINGEMENT

The primary imaging technique for diagnosis of this condition is MR arthrography and ultrasound can only assess the anterior and superior labrum (where most pathology occurs) but is still insensitive to undisplaced tears. However ultrasound can aid diagnosis when the labrum is
thickened or has an associated cyst. Ultrasound also has an important role in detecting alternative diagnoses such as iliopsoas tendon abnormalities or hernias.

**HIP ARTHROPLASTY AND INSTRUMENTATION**

Complications include infection (acute or chronic), aseptic implant loosening and granulomatous disease (wear disease secondary to debris). All these conditions can produce effusion and other non-specific imaging features. Large periarticular effusions are being increasingly described with resurfacing femoral head arthroplasties and may be secondary to a localised immune response.

Ultrasound can play an important role in detecting and aspirating effusion to aid diagnosis. Ultrasound also has the ability to detect hypoechoic periarticular collections and oedema associated with metalwork infection which are not seen on radiography or obscured by artefact on MR imaging.

**PELVIC MUSCLE AND TENDON INJURY**

In the pelvis the main tendons which can present symptomatically are those of the adductor longus, gluteal muscles, tensor fascia lata and iliopsoas. Areas of mechanical friction are important for the development of chronic damage (and tendon snapping) occurring at the iliopectineal eminence (iliopsoas tendon), greater trochanter (gluteal tendons and TFL) or from overlap with adjacent tendons (gluteal tendons). Adductor longus tendinopathy is common but can be asymptomatic while tenoperiosteal disease seems to be a more important source of chronic groin pain.

**ILIOPSOAS**

Ultrasound evaluation is made in the transverse plane at the level of the iliopectineal eminence and hip joint. Tendinopathy appears hypoechoic with thickening and loss of the normal fibrillar pattern. Adjacent bony abnormality (spur, osteophyte) can also be detected. Snapping can be confirmed on dynamic hip flexion with the tendon seen to have lost its normal smooth translation from lateral to medial being replaced by juddering and sudden displacement correlating with symptoms. Ultrasound guided injection of steroid and anaesthetic is an effective treatment to reduce inflammation and allow rehabilitation.

**QUADRICEPS**

Rectus femoris has 2 tendons originate from the anterior inferior iliac spine (long head) and acetabulum (short head) adjacent to the hip capsular margin. Proximal tendon disease is rare but acute apophyseal avulsions can occur at the anterior inferior iliac spine in skeletally immature patients usually during kicking or tackling. Ultrasound can confirm the intact tendon and any associated bone and cartilage fragment allowing accurate evaluation of displacement relevant in dictating whether surgical reattachment is necessary.

In skeletally mature athletes proximal myotendinous injuries occur at the merger of the 2 rectus femoris heads just distal to the level of the hip joint. This injury is not as common as distal myotendinous injuries. The quadriceps muscles are also a common area for scarring and myositis ossificans because of frequent athletic injury and contusion.
GLUTEAL

The gluteal muscles are important postural muscles and bursae are present between the individual tendons as well as between the tendons and the greater trochanter. Although symptoms in this area are commonly attributed to bursitis in practice a fluid collection is rarely seen with tendinopathy and oedema more commonly found on imaging.

MEDIAL THIGH

The adductor muscles are best visualised as they originate from the pubis and inferior pubic ramus with the thigh in abduction and external rotation and the knee flexed. In this position adductor longus is the most prominent muscle and is easily palpable. Adductor longus is the most commonly injured muscle with a muscle strain or tear at the proximal or distal myotendinous junction. Proximal tendon avulsion and not myotendinous injury is more common in mature athletes due to chronic background tendinopathy.

HERNIAS

INGUINOFEMORAL HERNIAS

The majority of clinically significant hernias can be diagnosed on clinical examination and managed without the use of diagnostic imaging. However a significant proportion of patients with symptoms suggestive of a hernia are found to have inconsistent clinical examination findings.

In adults ultrasound has been shown to be an accurate pre-operative technique for confirming and classifying hernias evident on clinical examination but also for clinically equivocal patients. Ultrasound can also detect fat filled hernias not seen at herniography.

EXAMINATION TECHNIQUE AND NORMAL ULTRASOUND APPEARANCES

Initially it is important to identify the inferior epigastric vessels and deep inguinal ring (6). One method is to scan rectus abdominis transversely and identify the inferior epigastric vessels within the deep aspect of the rectus sheath. Then by continuously scanning can be followed inferiorly as they join the external iliac vessels. However in obese patients, another technique is to identify the femoral vessels in the transverse plane and move cranially until the epigastric vessels are seen at their origin.

A longitudinal image of the inguinal canal is then obtained with the inguinal ligament seen as a linear fibrillar echogenic structure deep to the subcutaneous fat blending. Deep to the ligament are multiple hyperechoic and hypoechoic linear structures (representing vessels, nerves and cords) within the canal. The canal should also be assessed in its short axis, which is the anatomical sagittal plane.

Assessment of the canal with the patient at rest and straining (performing a slow Valsalva manoeuvre) is performed. Normally there can be mild bulging of the posterior wall and peritoneum but it should not occlude the canal (please see later). On straining in a normal subject, there may be slight vessel dilatation and sliding of contents within the canal but bowel should only move towards the canal and not completely efface or enter it.

ULTRASOUND APPEARANCE OF INGUINAL HERNIAS

In the transverse plane an indirect hernia arises lateral to the epigastric vessels and extends through the long axis of the canal. When scanning sagittally (short axis of the canal) the indirect hernia distends the canal and effacing its contents. Direct inguinal hernias occur due to a defect in the posterior inguinal wall and rarely continue distally. In the transverse plane a direct hernia will protrude through the posterior defect medial to the epigastric vessels. In the sagittal plane the direct hernia will push into the canal from the posterior aspect and efface its contents.
**Musculoskeletal System**

‘BULGING’ AND ‘PRE-HERNIA COMPLEX’

Bulging of the transversalis fascia, where the posterior inguinal wall almost occludes the canal on straining but with no actual herniation has been proposed as a source of pain or as a ‘pre-hernia’ condition. Unfortunately ultrasound and herniography studies do not confirm that this feature correlates with pain or is part of the spectrum of direct hernia. As this finding does not represent a definite hernia it should be cautiously interpreted as a positive feature.

**POST OPERATIVE EVALUATION**

When a mass recurs after surgical repair ultrasound can help differentiate between recurrent hernia and a static haematoma, infection or seroma. If a mesh is used it can be visualised as a hyperechoic linear structure just adjacent to the epigastric vessels.

**FEMORAL HERNIA**

The femoral canal is located just below the inguinal canal the femoral canal lies immediately medial to the femoral vein. On performing a Valsalva manoeuvre the femoral vein should distend and the adjacent tissues are not distorted. A femoral hernia expands the canal compressing or preventing the normal expansion of the femoral vein.

**ABDOMINAL WALL AND INCISIONAL HERNIAS**

These hernias involve protrusion of at least peritoneum and preperitoneal fat through a defect in the abdominal wall musculature and fascia. They can be classified as Spigelian, incisional and umbilical. The role of ultrasound is to confirm the presence and contents of the hernia (fat and/or bowel) as well as measuring the size of the defect in the echogenic deep fascia.

**ALTHETIC GROIN PAIN (PUBALGIA)**

- Pubalgia = chronic athletic groin pain (> 3 months)
- Multiple aetiologies implicated involving the symphyseal and inguinal soft tissues
- Athletes commonly have some background asymptomatic adductor tendinopathy
- MR imaging can define symptomatic adductor entheseal change
- Ultrasound is used to exclude hernia or acute tendon injury but is frequently negative in these athletes
- Ultrasound guided injection of the symphysis pubis or adductor region

**THE ROLE OF ULTRASOUND?**

Ultrasound is initially performed in parasymphyseal pain to rule out inguinal hernia or acute on chronic tendon or muscle strain (particularly of adductor longus).

If ultrasound is normal and the clinicians are confident of an inguinal soft tissue abnormality (eg. external oblique or conjoint tendon tear) no other imaging is performed as ultrasound cannot detect the small tears described in surgical series or subtle adductor enthesis change. However if the clinical opinion is that the pain is symphyseal in origin MR imaging is performed to assess the degree of symphyseal and adductor entheseal oedema which does significantly correlate with current symptoms.

However ultrasound guided needle placement is still valuable in performing therapeutic injection in osteitis pubis or adductor enthesis.

For injection of the symphysis pubis a 22-gauge spinal needle is introduced using a transverse oblique or sagittal approach as a pure transverse position may lead to piercing of the medial inguinal contents.
CONCLUSION

Ultrasound plays an important role in diagnosis for the adult hip and pelvis. Even where the technique has limitations in detecting subtle oedematous change better seen on MR imaging it still has a significant role in guided intervention.

SUGGESTED READING

Musculoskeletal System

Hip Ultrasonographic Screenings in Newborn Nurseries

Chia-Hsieh Chang, MD; Hui-Wen Chen, MD; Yu-Ying Chen, PT, MS; Ken Nan Kuo, MD
Chang Gung Memorial Hospital, Taipei, Taiwan

Purposes: Hip screening is recommended for the early detection of hip dysplasia; however the efficacy was questioned. We performed ultrasonography to objectively observe the hip development in newborns and investigated the rationale behind hip screening.

Methods: A total of 1333 newborns (705 male and 628 female) received hip ultrasonography in the first week of life. Clinical hip instability was detected by the Ortolani test. Hip dysplasia was defined by static ultrasonography. A second survey was performed one month later on the babies with clinical hip instability or ultrasonographic Graf’s type IIa, IIc, D, III and IV hips. All the hip ultrasonographies were performed by single investigator.

Results: Clinical instability was detected in 13 hips of 10 babies. Manual tests helped to detect unstable hips that had worse ultrasonographic measurements than those stable hips. Five Graf’s type IIc hips and 4 type III hips were detected in 7 babies. At one month of age, all the hips became stable and more mature. Eight of the 9 Graf’s type IIc or III hips became physiological status without treatment.

Conclusions. A strong trend of spontaneous resolution of newborn clinical hip instability and ultrasonographic dysplasia was revealed. We recommend manual test in newborn nursery to detect the hips at risk of dysplasia and ultrasonography after the first month of life to confirm the diagnosis.

Clinical significance: The results did not support immediate treatment on the basis of newborn manual or ultrasound hip screening.

Musculoskeletal Ultrasound for Sports Related Hip Disorders

Yi-Pin Chiang, M.D.
Mackay Memorial Hospital

Musculoskeletal ultrasound (MSUS) is an important image tool for evaluation of soft tissue lesions. With advanced technology, lap-top size or smaller hand-hold size ultrasound machines are available. Small ultrasound machines are ready to be carried on as a good first-line image tool to evaluate sports injury happening in the field. Their resolution for superficial tissue has been compatible with MR. Besides, ultrasound can provide a safe and accurate guidance for injection or aspiration to the athletes. Vascularity of the lesions can also be easily detected with ultrasound. Those are the reasons that make MSUS a more and more popular tool in dealing with sports injury.

MSUS can be applied sports related groin and proximal thigh injury. The most frequent sports injuries to be examined by MSUS are muscle and tendon injury, bursitis and hematoma. MSUS could be used for evaluation of other lesions such as joint effusion, sports hernia, nerve impingement, labrum tear, bony surface lesions or avascular necrosis of femoral head. High frequency linear array transducers are preferred for superficial lesion and a low frequency curve-linear array transducer can be used for large and deep muscle injuries.

In conclusion, ultrasound is a good image tool for sports related hip disorders.
US of Hip Mass

Hong-Jen Chiou, MD
Department of Radiology, Taipei Veterans General Hospital

The indications for ultrasound of the adult hip include soft tissue injury, tendon pathology, arthritis, soft tissue masses or swelling, nerve entrapment, effusion, and bone injury, etc. The scanning technique performed from anterior, posterior, medial, and lateral approaches. This talk is major on the soft tissue mass surrounding the hip joint, therefore the scan direction should be modified according to the soft tissue mass region. The common disorder surrounding the hip includes trauma, infection, neoplasm, vascular disease, congenital anomaly, etc. Hip joint effusion is very easy to detect by US. In children, 90% of hip joint effusion is due to transient synovitis. In adult, most of the joint effusion is due to osteoarthritis and osteonecrosis. Sometimes, synovial disease could do this such as RA, PVNS, synovial chondromatosis, etc. The US manifestation in soft tissue mass around the hip joint will be discussed as follow:

Benign lesions:

**Hematoma:** The typical patterns in hematoma were heterogeneous hypoechoogenicity or hyperechogenicity depending on the age of hematoma, well or ill-defined in margin and avascular in CDUS.

**Pseudoaneurysm:** The pseudoaneurysm usually presented as a characteristic extraluminal pattern of blood flow, which shows variable echogenicity, interval complexity and to-and-fro on color Doppler ultrasonography.

**Muscle rupture:** Most patients presented as heterogeneous hyperechoic in muscle retraction side, ill-defined in margin, ovoid in contour, solid in content, moderate in size, avascular or hypovascular in CDUS. Sometimes, it would associate with heterogeneous blood clot or echo-free fluid accumulation.

**Abscess:** Variable sonographic appearance, they are typically anechoic or hypoechoic, well defined, posterior acoustic enhancement, and possible anechoic fluid motion during transducer compression, and hypervascularity. Except the US findings, the clinical symptom was also very important, such as infectious sign.

**Bursitis:** The typical patterns in bursitis were mentioned as hypoechoic or anechoic fluid accumulation with or without septum formation, ill-defined margin, grade 2 CDUS.

**Lymphadenitis:** The typical presentation of lymphadenitis were heterogeneous hypoechogenicity, well-defined in margin, ovoid in contour, solid in content, small to moderate in size, moderate to marked hypervascularity from hilum in CDUS, moderate RI. Most patients presented as hilum within the lesion, some with several nodules and increased echogenicity surrounding fat.

**Hernia:** The ultrasonography of hernia was depended on the content of the hernia sac, if bowel loop, the real time ultrasonography could demonstrate the peristalsis or dilatation of the bowel loop. If fat content, US pattern usually present as sliding mesentery fat during valsava maneuver. If muscle hernia, the typical pattern was defect of epimysium and protruding of muscle perimysium during muscle stress.

**Ganglion:** The ganglion is a cystic mass, usually attached to the tendon sheaths and occasionally within the tendon, muscle, fat tissue, cartilage and even bone. It is typically with uni- or multilocular cystic spaces with a myxoid matrix, and usually presents as homogeneous in content.

**Lipoma:** Lipoma is a benign tumor which contains mature fat cells within a thin fibrous capsule, it usually locates on subcutaneous and distributed in the whole body. Most of the lipoma presented the specific patterns of “parallel echogenic lines” or focal homogeneous hyperechogenicity, avascular in CDUS.

**Myositis ossificans:** Myositis ossificans is a generally solitary benign, self-limiting ossifying process occurring in the musculature of the extremities in young men and is related to trauma in about half of the cases, lamellar bone forms at the periphery of the lesion and proceeds toward its center. The ultrasonography of myositis ossificans usually presented as heterogeneous hyperechogenicity, ill-defined margin, lobulated shape, solid content, big in size and grade 2 in CDUS.
Musculoskeletal System

Neurogenic tumor: The neurogenic tumor usually presented as well defined in margin, heterogeneous hypoechoic, mass continuity to the nerve bundle, with or without distal sound enhancement, fluid-filled cyst. There were only one third patients with prominent nerve bundle surrounding and target pattern in our experience.

Hemangioma: Hemangioma is the most frequently encountered vascular soft-tissue abnormality. The typical ultrasonographic patterns were heterogeneous echogenicity, ill-defined in margin, solid and cyst in composition and hypervascularity. However, good compressibility, echogenic in rim, and phlebolith had very high positive predictive value for hemangioma.

Malignant lesions:

Metastasis: Most metastases were coming from carcinoma origin, rarely from sarcoma origin. Most of them were moderate or large in size, heterogeneous hypoechochogenicity, infiltrated in margin, scalloping in contour, solid in composition, moderate hypervascularity in CDUS, and moderate RI. If the tumor was close to the bony cortex, it usually resulted in surrounding bone destruction.

Osteogenic sarcoma: Most of OGS with soft tissue involvement presented as heterogeneous hyperechogenicity, infiltrated in margin, scalloping in contour, solid in composition, big in size, moderate hypervascularity in CDUS, and moderate in RI. There were also with surrounding bony destruction, bony fragment, and sunburst periosteal reaction in most patients.

Malignant fibrohistiocytoma: The typical patterns in MFH were heterogeneous hypoechochogenicity, infiltrated in margin, scalloping in contour, solid in composition, big in size, moderate hypervascularity in CDUS. In patient with bony destruction which is different to OGS on the base of lack of sunburst periosteal reaction but only soft tissue periosteal thickening. In patient with advance amorphous calcification within the tumor which should differentiate from myositis ossificans.

Liposarcoma: The echogenicity of liposarcomas usually different depend on the cell type, in well-differentiated liposarcomas, the US usually presented as hyperechochogenicity; in myxoid type, the most common liposarcomas, usually presented as heterogeneous hypoechoctic with or without hyperechoic retained lipoblast nets. The typical patterns in liposarcoma were heterogeneous hyperechogenicity, infiltrated in margin, scalloping in contour, solid in composition, big in size, moderate hypervascularity in CDUS, echogenic fat within tumor.

Lymphoma: The peripheral soft tissue lymphoma could present as mass, nodal, nodular, myositis, and cellulitis types. The ultrasonographic patterns of peripheral soft tissue lymphoma depended on the types. The typical patterns in peripheral lymphoma were relatively homogeneous hypoechochogenicity, infiltrated in margin, scalloping in contour, solid in composition, big in size, marked hypervascular in CDUS in mass, nodal and myositis types. In nodular type, the typical presentation was multiple small hypoechoic nodules, hypervascularity. In cellulitis type, the typical presentation was echogenic subcutaneous fat lobules, ill-defined in margin, and hypervascularity. From our previous report, the peripheral soft tissue lymphoma was more common on mass and nodal type.

Leiomyosarcoma: The role of ultrasound is to provide the information of tumor size and internal characteristics and guided biopsy. And it could present as heterogeneous hypoechochogenicity, infiltrated in margin, scalloping in contour, solid in content, big in size, moderate hypervascularity in CDUS, and moderate RI.

Synovial SA: It occurs predominantly in the extremities, especially the knee joint. Most patients presented as heterogeneous hypoechochogenicity, well-defined or infiltrated in margin, scalloping in contour, solid and/or with necrosis in content, moderate to big in size, moderate hypervascularity in CDUS, and moderate RI.

There are many other histology of soft tissue mass could be occurred surrounding the hip not mentioned above, but usually very rare.

In conclusion, there were several parameters in US in the evaluation of peripheral soft tissue mass surrounding the hip, such as echogenicity, margin, morphology, composition, size, vascularity and other specific patterns, the high resolution US could make a good differentiate diagnosis among the ganglion, hemangioma, lipoma, epidermoid cyst, bursitis, hemATOMA, abscess, pseudoaneurysm. The HRUS is also a good modality in the detection of soft tissue mass lesion and provide the initial differential diagnosis.
Ultrasound for Diagnosing Gouty Arthritis

Kuo-Lung Lai, Ying-Ming Chiou
Division of Allergy, Immunology and Rheumatology, Department of Internal Medicine, Changhua Christian Hospital

Background: Urate crystal deposition in joint is the hallmark of gout. The aim of our study is to determine the characteristic sonographic features of gouty arthritis, and to evaluate the utility of ultrasound (US) in diagnosing gouty arthritis. Methods: Eighty arthritic patients underwent US-guided joint aspiration for diagnostic purpose in our rheumatology division from March 2009 through March 2010 were enrolled. We compared the sonographic images of gouty arthritis with those of non-gouty arthritis. Results: Thirty-four patients had gouty arthritis (52 involved joints) and 46 patients had non-gouty arthritis (52 involved joints). The most common joint areas were knee and ankle in both groups. Hyperechoic deposition on the surface of articular hyaline cartilage, namely double contour sign, suggested gout with a sensitivity of 36.8% and a specificity of 97.3%. Hyperechoic deposition in the synovial membrane suggested gout with a sensitivity of 76.9% and a specificity of 65.4%. Both double contour sign and synovial hyperechoic deposition were significantly more prevalent in gouty joints than those in non-gouty joints (both p<0.001). No significant difference in synovial fluid hyperechoic aggregations, bone erosion and synovial vascularity between gouty joints and non-gouty joints. Conclusion: Double contour sign is specific to gout. US provides aid in diagnosing gouty arthritis, particularly in patients who have contraindications of arthrocentesis.
The Correlations between Periarticular Soft Tissue Injuries and Hemiplegic Shoulder Pain in Acute and Chronic Stages of Stroke

Yu-Ping Pong, Yu-Chi Huang, Pei-Jung Liang
Department of Physical Medicine and Rehabilitation, Chang Gung Memorial Hospital–Kaohsiung Medical Center, Chang Gung University College of Medicine, Kaohsiung, Taiwan

Background: Hemiplegic shoulder pain (HSP) is the most common complication after a stroke. Periarticular soft tissue injury is one of the most important associated factors for HSP. The aim of this study is to observe the presence and severity of HSP and to explore the correlation between HSP and abnormal sonographic findings at both acute and chronic stage. Materials and Methods: We enrolled 76 hemiplegic stroke patients admitted to the rehabilitation department. The presence of HSP and pain severity (VAS score) were recorded by one therapist and shoulder sonography was performed by the same physiatrist at admission (acute stage) and 6 months after discharge (chronic stage). The presence and severity of HSP between acute and chronic stages were compared with McNemar test and Pair T test respectively. The correlation between HSP and abnormal sonographic findings were analyzed by Point-Biserial correlation test. A statistical significance was defined as $p<0.05$. Results: Seventy-six patients completed all evaluations at acute and chronic stages. Forty-six (60.5%) patients at acute stage and 62 (81.6%) patients at chronic stage had HSP ($p<0.01$). VAS score of HSP significantly increased at chronic stage. Abnormal sonographic findings were noted in 45 patients (59.2%) at acute stage and 61 patients (81.3%) at chronic stage. At both acute and chronic stages, effusion and tendinopathy of the biceps tendon long head and tendinopathy of supraspinatus tendon were the major findings. In addition, abnormal sonographic findings of biceps tendon long head ($p<0.01$) and subscapularis tendon ($p=0.01$) significantly increased at chronic stages. At chronic stage, significant correlation was noted between HSP and abnormal sonographic findings ($r = 0.45$), bicipital tendinopathy ($r = 0.24$) and supraspinatus tendinopathy ($r = 0.25$). Conclusion: We found abnormal sonographic findings were moderately associated with HSP. Therefore, periarticular soft tissue injuries play an important role for chronic stroke patients with HSP, especially effusion/ tendinopathy of the biceps tendon long head and tendinopathy of supraspinatus. Key words: stroke, hemiplegic shoulder pain, sonography
The Assessment of the Ulnar Nerve and Cubital Tunnel by Ultrasonography in Juvenile Baseball Players

Kuo-Chen Wu¹, Ta-Wei Tai², Tai-Chang Chern³, I-Ming Jou²
¹Department of Orthopedics, Kuo’s General Hospital, Tainan, Taiwan
²Department of Orthopedics, College of Medicine, National Cheng Kung University, Tainan Taiwan
³Chern Tai-Chung’s Orthopedics Clinic, Ping-Tong, Taiwan

Introduction: The throwing athletes have high rate of elbow injury. Beside the clinical injury, some subclinical injuries or laxity of the medial elbow were also reported in the literature. The ulnar nerve passed through the cubital tunnel in the medial elbow and was potentially injured by the repeated throwing activity. The aim of this study is to evaluate the ulnar nerve in the cubital tunnel in the juvenile baseball players by using high-resolution sonography.

Materials and Methods: A total of 63 juvenile baseball players (aged 12 – 14) participated in this study. They were divided into the pitcher group and the fielder group. The cubital tunnels of both elbows were examined with sonography by a experienced orthopaedic surgeon. The morphology and location of ulnar nerves were documented when the elbows were flexed 0°, 45°, 90°, and 120°.

Results: The ulnar nerve translated anteriorly with elbow flexion. The distance of anterior translation is more in dominant side than non-dominant side. The pitcher group also showed more anterior translation than the fielder group. The pitcher group had higher chance that the ulnar nerve translated anteriorly across the medial condyle of humerus in elbow flexion 90°, and 120°.

Discussion and Conclusion: With repeated throwing activity, we found that the ulnar nerve is more mobile due to elbow laxity. This phenomenon is a protective mechanism or a hint of the elbow injury is still controversial. Further study is needed to clarify it.