Año XIII -número 29

Ultrasonografía

REVISTA ARGENTINA

Asociación Médica Argentina

Sociedad Argentina de Ecografía y Ultrasonografía

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Av. Santa Fe 3711 - PB "C"
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Tel./Fax: (0 11) 4832-0010 / 4833-7003
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6 Certificado de aptitud psicofísica para el ejercicio de la profesión expedido por otro profesional médico.

7 El postulante deberá acreditar, luego de la obtención del título de Formación Especializada en Ecografía y durante los últimos 5 años continuidad en el ejercicio de la especialidad; la participación a congresos, jornadas o actividades científicas que demuestren su inquietud por mantener una actualización permanente, actividades docentes, de investigación y/o la presentación de tra-bajos en medios debidamente reconocidos.

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Deben ser presentadas dos copias completas del artículo junto con las ilustraciones y tablas. No enviar materiales originales. Mecanografiar en papel obra blanco 70/80 grs. de 216 x 279 mm. o ISO A4, de un sólo lado del papel. Usar doble espacio en todo el documento, incluyendo todas las secciones del manuscrito. También se puede enviar el trabajo por mail, diskette o preferentemente en CD.

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El resumen llevará no más de 150 palabras y estará escrito en castellano y en inglés. Debe mostrar el propósito del estudio o investigación, procedimientos básicos, análisis, hallazgos y las conclusiones principales.

Debajo del resúmen, suministrar e identificar de 3 a 10 palabras claves.

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El trabajo mantendrá el siguiente ordenamiento:

Introducción:
Establece el propósito del articulo. Resume la razón fundamental para el estudio u observación. No incluye datos o conclusiones del trabajo que está siendo informado.

Material y Métodos:
Describir claramente la selección de los temas u objetos en los que se realizó el experimento u observación (pacientes o animales experimentales, incluyendo los controles). Estadísticas: Describir los métodos estadísticos con suficiente detalle para permitir a un lector bien informado, el acceso a datos originales para verificar los resultados reportados.

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Presentar los resultados en una secuencia lógica con el texto, tablas e ilustraciones. Realizar o resumir sólo observaciones importantes.

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Enfatizar los aspectos nuevos e importantes del estudio y sus conclusiones, los hallazgos y sus limitaciones, incluyendo implicancias para investigaciones futuras. Establecer nuevas hipótesis cuando se encuentren garantizadas y esténclaramente establecidas.

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Cada página tiene un título y va por separado.
Numerar las tablas consecutivamente en el orden de su primera ubicación en el texto.

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Título:
Displasias fetales esqueléticas
Dr. Adrián Clavelli

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OCTUBRE 2008

18th World Congress of the International Association of Surgeons, Gastroenterologists and Oncologists
8 al 11 de Octubre
The Istanbul Convention & Exhibition Centre
Informes: Tel.: +90 31 2305 - 1490
E - mail: bayrak@hacettepe.edu.tr
www.iasg2008.org

18th Annual Conference on Musculoskeletal Ultrasound
October 21-24, 2008
Panamericano
Hotel & Resort
Buenos Aires - Argentina
www.saeu.org.ar

XXIII Congreso Venezolano de Radiología y Diagnóstico por Imágenes SOVERADI 2008
22 al 25 de Octubre
Hotel Radisson Eurobuilding
Caracas, Venezuela
Informes: www.soveradi.org.ve

XXXVII Congresso Brasileiro de Radiologia

XXIV Congresso Interamericano de Radiología

VI Jornada Sudeste de Radiologia e DI
9 al 12 de Octubre
Expominas - Belo Horizonte - MG
Informes: http://www.cbr.org.br/

XIX Congreso Latino Americano de Ginecología y Obstetricia
27 al 31 de Octubre
Ciudad de Mendoza, Argentina
Informes:
www.fasgo.org.ar

XXIII Congreso Nacional de Imagenología Diagnóstica y Terapéutica
29 de Octubre al 1 de Noviembre
Guadalajara, Jalisco, México
Informes: www.fmri.org.mx

NOVIEMBRE 2008

XII Congreso Internacional Radiología en Oncología, Patología Cardiovascular
1 al 4 de Noviembre
Monterrey
Informes: www.crinl.org.mx
ignacio.cano@itesm.mx

94th RSNA

Scientific Assembly and Annual Meeting
30 de Noviembre al 5 de Diciembre
McCormick Place, Chicago, Illinois
Informes: 820 Jorie Boulevard
Oak Brook, IL 60523 - 2251
Tel.: (630) 571 - 2670
Fax: (630) 571 - 7837
www.rsna.org

III congreso de ultrasonografia y clínica embrio- fetal
Hotel Ucaima - Valencia
Noviembre de 2008

JULIO 2009

XIII World Congress of Echocardiography and Vascular Ultrasound
18 al 20 de Julio
Kobe, Japan
Informes: Navin C. Nanda

International Society of Cardiovascular Ultrasound
P.O. Box 323, Gardendale
AL 35071, USA
Tel: 205 - 934 - 8256
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AGOSTO 2009

12th World Congress of the World Federation for Ultrasound in Medicine and Biology (WFUMB)
Sydney Convention and Exhibition Centre
28 de Agosto al 3 de Septiembre
Sydney, New South Wales
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POSTERIOR GLENOID IMPINGEMENT

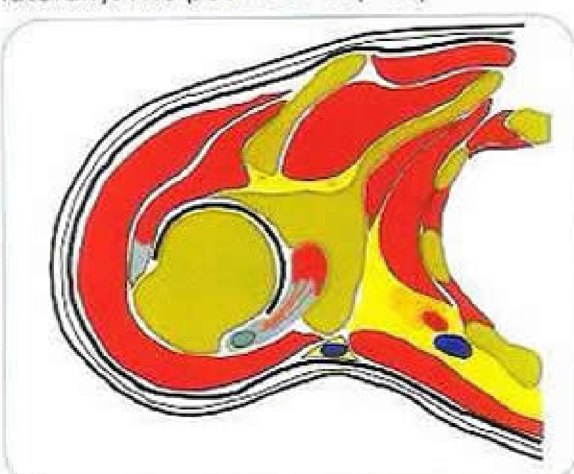
M van Holsbeeck, MD, P Kolowich, MD,

M van Holsbeeck, MD Division Head Musculoskeletal Radiology at Henry Ford Hospital Professor of Radiology Wayne State University School of Medicine, USA

ANATOMY

Infraspinatus

*Muscle mass fills the infraspinatus fossa. The fibers originate from the inferior aspect of the spine of the scapula and from the posterior scapular bone surface distal to the spine. The infraspinatus also originates from its investing fascia turning the region below the spine in an osteofibrous tunnel. The three major muscle bundles of the infraspinatus end in a tendon that conjoins the supraspinatus upon the middle facet of the greater tuberosity.
*Externally rotates the arm.
*Innervated by the suprascapular nerve (C5,C6)
Teres minor
* Small round muscle, which appears more rectangular in shape on ultrasound, originates from the lateral margin of the scapula. With its cranial and lateral extension it inserts on the most inferior surface of the greater tuberosity with a short muscular appearing attachment.
* Externally rotates the arm.
*Innervated by the axillary nerve (C5,C6)
Infraspinatus Recess
The Infraspinatus Recess of the joint capsule contains posterior labrum and capsule medially. The infraspinatus re-enforces the recess posteriorly and laterally. The posterior supraspinatus borders the superior aspect of the recess and the teres minor the inferior aspect.



Maneuver (see diagram above)
Simple internal and external arm rotation may demonstrate capsular and/or labral deformity or detachment. Abnormalities in throwing athletes will stand out more clearly by abducting and externally rotating the arm. A forward shift of the humerus can result in entrapment of tendon and labrum within the posterior gleno-humeral joint (internal impingement/ gleno-humeral impingement).

Pathology

Introduction

1. Internal Glenoid Impingement is probably the most common cause of posterior shoulder pain (pain in the back of the shoulder) in the throwing or overhead athlete
2. It is commonly misdiagnosed as rotator cuff (RTC) tendonitis.
3. It is also called posterior-superior glenoid impingement or PSGI for short.

Jobe, Arthro 1995

a. PSGI is caused by the impingement of the articular surface (intra-articular) of the RTC (posterior edge of the supraspinatus and the anterior edge of the infraspinatus) against the posterior-superior-glenoid and glenoid labrum

b. It mainly seen in overhead athletes but occurs at an alarming rate in weight lifters do to poor lifting technique (and utilize high-risk exercises) and patients involved in occupational overhand activities such as mechanics, electricians, stocking shelves, or steering tow motors, etc.

c. The mechanism of injury is shoulder extension, abduction and ER mechanism. This is the exact mechanism the arm is in when you try and throw a ball overhand.

Arroyo, Orth Clin North Am 1997

d. Humeral retro-version (the bone structure of the humerus is developed rotated back into external rotation as an adaptation to repetitive throwing) may be present as an underlying etiology to reduced Internal rotation.

Instability as a cause of PSGI

1. The glenohumeral joint (GHJ) is dependant on the RTC to provide dynamic stability during high velocity movements such as throwing.
2. Throwing also requires excessive ROM, especially external rotation. It is this excess ROM that predisposes the GHJ to instability.
3. Chronic repetitive eccentric loads on the subscapularis muscle (the RTC muscle that is on the front of the shoulder) during the cocking motion lead to micro-trauma and weakness.
4. Loss of the subscapularis force couple leads to anterior instability and hyper-angulation of the humerus in relationship to the scapula (shoulder blade).
5. This may happen prior to symptom onset in the throwing shoulder.
   Buchberger, MSSE 1999, 31:S26
6. Scapular Dyskinesia causes glenoid ante-version and also increases the hyper-angulation of the humerus in relationship to the scapula
7. Subtle anterior instability (micro-instability) of the GHJ is accentuated in the presence of scapular dyskinesia.

Symptoms, history and patient presentation

1. Posterior shoulder pain in the throwing shoulder during the cocking phase
2. Posterior shoulder pain during the cocking phase that worsens during early acceleration is by itself an indication that the subscapularis is eccentrically weak and/or scapular dyskinesia is present.
3. Slow insidious onset; no history of trauma
4. Pain is primarily associated with the athletic activity
5. Pitching mechanics should be evaluated for faults in the balance leg and plant leg. Usually there is weakness of the gluteus maximus and gluteus medius.
   Buchberger JSCR 2000

Stages of Internal Glenoid Impingement

Stage I: Internal Glenoid Impingement

1. Symptomatology
   a. Stiffness; slow to warm up
2. Treatment:
   a. 2 weeks of throwing
   b. Strengthen cuff muscles
   c. Strengthen scapular rotators

Stage II: Internal Glenoid Impingement

1. Symptomatology
   a. Posterior shoulder pain
   b. Positive Jobe's relocation test
   1) Indicates anterior instability as etiology
2. Treatment
   a. 4-12 weeks of an interval throwing
   b. Rehabilitation program

Stage III: Internal Glenoid Impingement

1. Symptomatology
   a. Posterior shoulder pain
   b. Positive Jobe's relocation test
   c. Failure of an appropriate rehabilitation program
2. Treatment
   a. Anterior capsulo-labral reconstruction
   b. Thermal Capsulorraphy (TACS-Thermal Assisted Capsular Shrinkage)
   Jobe CM, OCNA, 1997

REFERENCES

Rakofsky M. Fractional arthrography of the shoulder. Gustav Fischer Verlag, Stuttgart, 1987.

Bureau NJ, Beauchamp M, Cardinal E, et al. Dynamic sonography evaluation of shoulder impingement syndrome. Am J Roentgenol 2006; 187(1):216-220.

Riand, et al. results of derotational humeral osteotomy in posterior-superior glenoid impingement. Am J Sports Med 1998; 26:454

Davidson PA, et al. Rotator cuff and posterior-superior glenoid labrum injury associated with increased glenohumeral motion: A new site of impingement. J Shoulder Elbow Surg 1995;4:384-390.

SONOGRAPHY IN THE MANAGEMENT OF DDH

MSUSOC 2008 Buenos Aires, Argentina

H. Theodore Harcke, MD, FACR, FAIUM, USA

Correspondence:
H. Theodore Harcke, MD, FACR, FAIUM
Department of Medical Imaging
Alfred I. duPont Hospital for Children
Wilmington, DE 19899
Tel: 302-651-4641/6806, Fax: 302-651-6888
Email: tharcke@nemours.org or
mstofa@nemours.org

OBJECTIVE

After this lecture, the attendee should be able 1) to describe the sonographic technique used to examine an infant wearing a Pavlik Harness and 2) to discuss frequency of examination based upon severity and the sonographic findings in successful and unsuccessful courses of treatment.

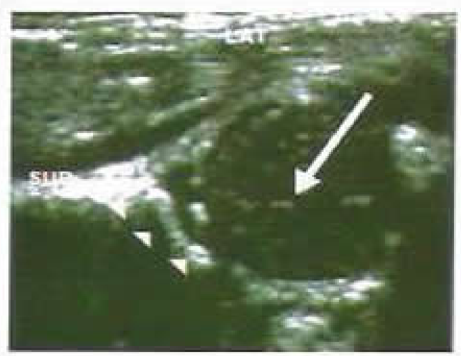
INTRODUCTION

Hip sonography is used after diagnosis of developmental dysplasia of the hip (DDH) to determine appropriate courses of management. For mild DDH in young infants, serial ultrasound studies can document spontaneous resolution. For treatment of more severe cases, the Pavlik harness is the most commonly used splint. Hip ultrasound technique is adapted to scan infants while they are wearing the harness. Serial examination provides the treating physician with precise information on treatment success or failure. Duration of treatment is modified based on ultrasound findings.

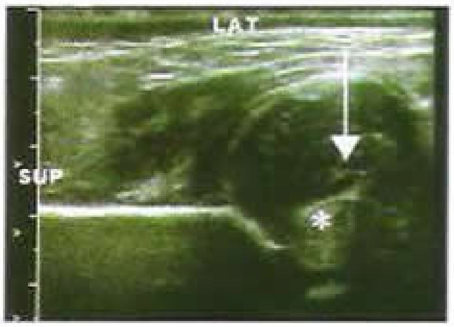
METHODS AND MATERIALS

When performing hip ultrasound for follow-up of an infant with DDH, the standard examination is modified after a splint device has been applied. This is because the goals of standard orthopaedic practice are 1) to avoid removal of the splint and 2) to gain information on the effectiveness of the splint (i.e., whether it has been applied and adjusted optimally). The Pavlik harness or a modification is the most commonly used device for the treatment of DDH in infants younger than six months. When applied correctly, it maintains the flexed hips within a range of abduction termed the "safe zone." The routine dynamic examination technique for the hip has four views. Two of these, the coronal flexion view and the transverse flexion view, are ideally suited for examining an infant wearing a Pavlik harness. The coronal flexion view allows assessment of femoral head position and the morphology of the acetabulum (Fig. 1). Both the cartilage labrum and the bony acetabulum are carefully examined. The transverse flexion view assesses position and stability of the femoral head, and is the most important view for judging harness fit and adjustment (Fig. 2) because it views posterior displacement, which is the direction of migration of the hip when the Pavlik harness is worn (1).

Fig. 1. Coronal flexion in Pavlik harness.
1A: Transducer position for right hip. The probe is in the left hand, the right hand guides femur movement (abduction / adduction). Hand positions are reversed when imaging the left hip (See Fig. 2).



1B: Normal sonogram. The femoral head (arrow) is seated in a well-developed acetabulum (arrowheads).
LAT = lateral, SUP = superior.

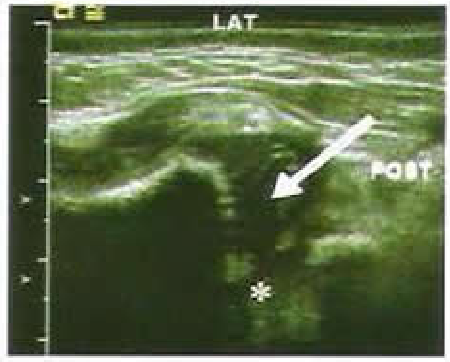


1C: Dislocated hip. The femoral head is laterally displaced (arrow). Echogenic fibro-fatty tissue is filling the acetabulum (*). LAT = lateral, SUP = superior.

Fig. 2. Transverse flexion view in Pavlik harness.

2A: Probe position in a left hip exam. Right hand holds the probe posterior and lateral to the hip. The left hand guides femur movement (adduction/ abduction).

2B: Normal sonogram. The femoral head (arrow) rests against the ischium with no lateral displacement (arrowheads). LAT = lateral, POST = posterior.



2C: Dislocated hip. The femoral head (arrow) is displaced laterally and posterior from the ischium. The acetabulum is medial to the displaced femur (*). LAT = lateral, POST = posterior.

As part of the harness assessment, the femur is gently abducted and adducted within in the range of motion allowed by the harness. This dynamic exam is done WITHOUT STRESS OR FORCE. The purpose of the harness is to keep the femoral head directed into the acetabulum, and nothing should be done that stretches the capsule and creates instability (2).

Serial examination with ultrasound within the harness indicates to the orthopaedic surgeon whether there has been improvement in hip pathology and if the harness is adjusted properly. The frequency of serial exams depends upon the severity of the abnormality. When a dislocated hip is treated with the harness, examinations should be weekly. If improvement is not documented within three to four weeks, another treatment option should be considered (3). When the dislocated hip reduces, the interval between exams lengthens. Subluxated hips need to be checked only at 2 to 3 week intervals. Once stability is achieved, the infant remains in the harness until the acetabulum develops satisfactorily (Fig. 3).

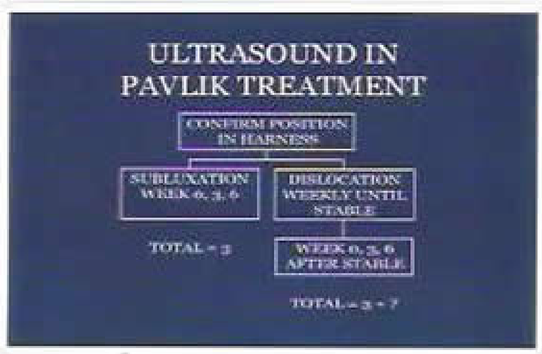


Fig. 3. *Example schedule for frequency of sonographic examination during Pavlik harness treatment. The schedule is changed depending upon progress, and failure to improve indicates the need to change treatment.*

The harness is not discontinued abruptly. Rather, the infant is allowed out of the harness for increasing periods of time (weaning). It is helpful at this time to obtain an anteroposterior radiograph of the pelvis with the hips in anatomic position. The purpose is to provide the orthopaedic surgeon with a baseline assessment of the bony acetabular index (angle). There have been reports of variation in ultrasound and radiographical assessments of the acetabulum, and this baseline image will prevent confusion as the infant grows and later radiographs are used for follow-up (4).

RESULTS

The literature indicates that the earlier the harness is applied (after age three to four weeks), the higher the rate of success in correction of hip abnormality. The harness is also more successful in hips with less severe abnormality. As noted above, a trial of the harness with dislocation can be successful in infants less than three months of age, but if there is no early improvement, the harness is discontinued (Fig. 4). In subluxated hips, a high rate of success is noted, and in the hip with instability, virtually all succeed. It is recognized that spontaneous improvement of DDH can occur with no treatment, and there is a risk for avascular necrosis of the femoral head when the Pavlik is used and not applied correctly. For this reason, the decision if and when to use the harness will vary between orthopaedic surgeons.

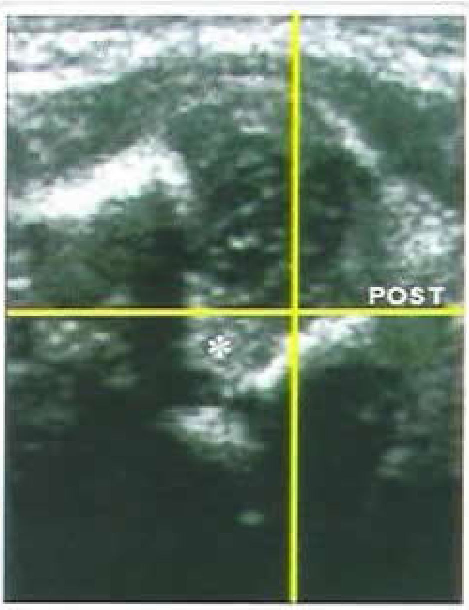
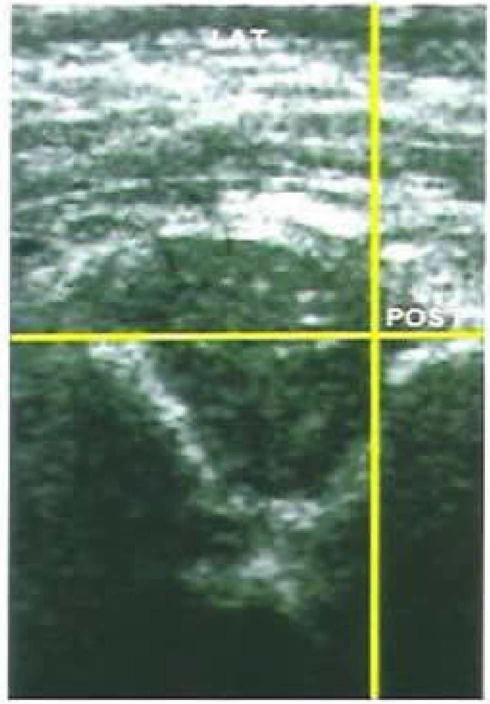


Fig. 4. Serial transverse flexion sonograms in an infant with a dislocated hip. 4A: At the time of harness application, the hip was laterally dislocated from the acetabulum (*). LAT = lateral, POST posterior.



4B: After three weeks of treatment, the femoral head has reduced and is in normal position. The harness was continued full-time for an additional four weeks to maintain hip position and allow the capsule to tighten up.

CONCLUSION

A modified ultrasound examination of the hip using coronal flexion and transverse views without stress permits assessment in the Pavlik harness. Monitoring harness treatment guides the orthopaedic surgeon in optimizing adjustment and in establishing that hip abnormality (position, instability, and acetabular dysplasia) is being corrected. Treatment can then be tailored to match progress and changed when it is not effective (Fig. 5)

Fig. 5. Cascade overview of management of DDH using ultrasound guidance.
5A: Technique for serial evaluation in Pavlik harness.

Pavlik Harness check after fitting.
Trial for disocation If no improvement in 4 weeks D/C.
Monitor subluxation in harness with no stress.
Stress test and X-ray at time of weaning.
X-ray follow-up.

5B: Serial steps in treatment.

5C: The radiograph at time of weaning provides an objective baseline for acetabular development. In this case, harness treatment was continued because of the left acetabular dysplasia (arrow).

WRIST - LIVE DEMO

Carlo Martinoli, MD

Cattedra di Radiologia - DICMI
Università di Genova, Italy

Last generation ultrasound (US) equipments are able to produce extremely high resolution images of the very small and superficial structures in the soft-tissues of the wrist and hand. Tendons, ligaments, muscles, vessels, nerves and bone surfaces are all depicted in exquisite details.
There are three definite prerequisites for a successful examination of the wrist and hand with ultrasound:

- In-depth knowledge of the normal anatomy and the most common anatomic variations
- Use of a correct, standardized technique of examination
- Familiarity with the normal US appearance of the individual structures and knowledge of the possible pitfalls

Patients referred for US usually have symptoms that are most often confined to one specific area in the wrist and hand. It is therefore logical to divide the ankle and foot into a radial, dorsal and volar aspects. At each of these aspects the normal appearance and anatomical relations of the following structures will be demonstrated:

RADIAL

I-III compartments of extensor tendons
Lister tubercle
I-II and II-III intersections
Superficial branch of the radial nerve
UCL MCPJ thumb

DORSAL

IV-VI compartments of extensor tendons
extensor tendon insertions in the fingers
DRJ, RCJ, MCJ, CMJ, MPJ recesses and articular surfaces
PIPJ and DIPJ recesses
Scapholunate ligament
Interosseous muscles

VOLAR

Carpal tunnel, bony landmarks
Flexor digitorum tendons (from the distal radius to the palm)
FCR, FCU and palmaris tendons
Median nerve and its divisional branches
Ulnar nerve and ulnar artery
Intrinsic hand muscles
Scaphoid
Flexor tendon arrangement and insertions in the fingers
Palmar plates

HIP - NORMAL US

Maura Valle, MD, Carlo Martinoli, MD

Reparto di Radiologia - Osp. "Giannina Gaslini". Genova, Italy
Cattedra di Radiologia - DICMI. Università di Genova, Italy

As US is best suited to examining focal abnormalities, patients referred for hip US have symptoms that are confined to one or two specific area. We could, therefore, subdivide the hip into four quadrants (anterior, medial, lateral and posterior) when considering anatomy and scanning technique. As regard positioning, the patient lies on the examination bed with the aspect of the hip to be evaluated adequately exposed. We usually start routine hip scanning with evaluation of the anterior region while keeping the patient supine; the lateral region is examined with the patient lying in a lateral position on the opposite side; then, the posterior hip structures are best investigated with the patient prone.

Anterior Hip

The hip joint is best evaluated on both longitudinal and transverse oblique planes obtained over the femoral neck. Longitudinal planes are well suited to demonstrate the anterior synovial recess, which lies between the deep fascia of the iliopsoas and the femoral neck **(Fig. 1a).** When examining this recess with US, care should be taken not to confuse the anterior and posterior layers of the joint capsule for an effusion, because the capsule may appear artifactually hypoechoic when imaged not perpendicularly to the US beam. In addition, these structures are more difficult to visualize in obese patients due to the deep position of the joint. In these patients, lower frequency transducers can help the examination. Cranial to the anterior recess, the fibrocartilaginous labrum of the acetabulum can be detected as a homogeneously hyperechoic triangular structure. US can accurately image the muscles located superficially to the hip joint. From lateral to medial: the anterior hip muscles are the tensor fasciae latae, the rectus femoris, the sartorius, the iliopsoas and the pectineus. Over the joint space, the iliopsoas muscle is the first to be identified in a lateral position relative to the femoral neurovascular bundle. Its tendon lies in an eccentric position within the posterior part of the muscle belly. A synovial bursa, the iliopsoas bursa, intervenes between the tendon and the anterior capsule. The main function of this bursa is reduction of tendon friction over the hip joint during muscle activation and joint movements. In normal states, the iliopsoas bursa is collapsed and, therefore, cannot be detected with US. To examine the other muscles, US scanning should begin over the anterior superior iliac spine to demonstrate the cranial insertions of the sartorius (medial) and the tensor fasciae latae (lateral). These muscles are very superficial, arising just under the fascia. Soon after their origin, the sartorius directs medially to reach the internal aspect of the thigh, whereas the tensor fasciae latae proceeds laterally and caudally to insert onto the anterior border of the fascia lata. More cranial and medial scans reveal the intrapelvic portion of the psoas and the iliacus muscle which lies over the inner face of the iliac wing. The direct tendon of the rectus femoris takes its origin from the anterior inferior iliac spine. A careful scanning technique based on transverse and longitudinal planes may be useful to reveal the indirect tendon that joins the lateral aspect of the direct tendon. Within the proximal muscle, the central aponeurosis represents the distal continuity of the indirect tendon, whereas the superficial aponeurosis arises from the direct tendon.

Lateral hip

The US examination of the lateral hip quadrant is best performed by asking the patient to lie on the opposite hip assuming an oblique lateral or true lateral position. Transverse and longitudinal US images obtained cranially to the greater trochanter show the gluteus medius and the gluteus minimus. It must be noted that the anterior margins of these muscles blend together and that a definite demarcation between them may be feasible with US only posteriorly. To best recognize them, one could first obtain posterior US images over the anterior portion of the gluteus maximus as a landmark: moving the

Transducer anterior to this muscle, the posterior margin of the gluteus medius can be appreciated. In a more superficial position, the fascia lata appears as a linear hyperechoic band joining the anterior edge of the gluteus maximus and the posterior part of the tensor fasciae latae. The fascia lies over the lateral aspect of the gluteus medius and the greater trochanter. Once these muscles have been evaluated, the probe is moved down to reach the greater trochanter **(Fig. 1b)**. The gluteus minimus tendon is detected anteriorly as a hyperechoic structure that arises from the deep aspect of the muscle and inserts into the anterior facet of the greater trochanter. Longitudinal US images obtained over the lateral facet of the greater trochanter demonstrate the lateral tendon of the gluteus medius as a beak shaped structure, somewhat similar to the supraspinatus. Shifting the probe back, the anterior portion of the gluteus maximus can be seen covering the posterior part of the tendon of the gluteus medius. Due to a too small amount of fluid content, the bursae around the greater trochanter are not visible with US in normal conditions.

Medial Hip

Medial to the iliopsoas, US is able to image the femoral neurovascular bundle. The femoral nerve, the common femoral artery and vein are imaged in sequence from lateral to medial. Due to their small size, the divisional branches of the nerve are difficult to be examined with US soon after their origin. The femoral vein has a greater cross-sectional area than the artery and is easily compressible with the probe. The pelvic origin of the adductor muscles should be evaluated on transverse planes starting from the muscle bellies while the patient keeps its thighs abducted and externally rotated with the knee bent (frog leg position). Four muscles are recognized from surface to depth: adductor longus (superficial lateral) gracilis (superficial medial), adductor brevis (intermediate) and adductor magnus (deep). US scanning should extend upward following the myotendinous junction of these muscles and their tendons up to reach the pubis **(Fig. 1c)**.

Posterior Hip

To image the posterior quadrant of the hip with US, the patient is asked to lie prone with the feet hanging out of the examination bed. Transverse US planes are the most useful to recognize the hamstrings (long head of the biceps femoris, semitendinosus, semimembranosus) as individual structures. The ischial tuberosity is the main landmark, because it is readily apparent due to the posterior acoustic shadowing of bone and allows an appropriate localization of the surrounding anatomic structures. Once detected, the most cranial portion of the ischiocrural tendons can be demonstrated as they insert onto the lateral aspect of bone. At this level, the semimembranosus tendon and the conjoined tendon of the semitendinosus and the long head of the biceps femoris cannot be separated. Lateral to them, the sciatic nerve can be seen as a flattened structure with honeycombing echotexture surrounded by hyperechoic fat. More distally, the conjoined tendon of the semitendinosus and biceps femoris separates from the semimembranosus tendon: the first appears as a sagittal comma-shaped hyperechoic image located between the bellies of the semitendinosus (medial) and the biceps (lateral); the second continues in a large coronally-oriented aponeurosis which arises from the medial side of the tendon and directs medial and posterior to it **(Fig. 1d)**.

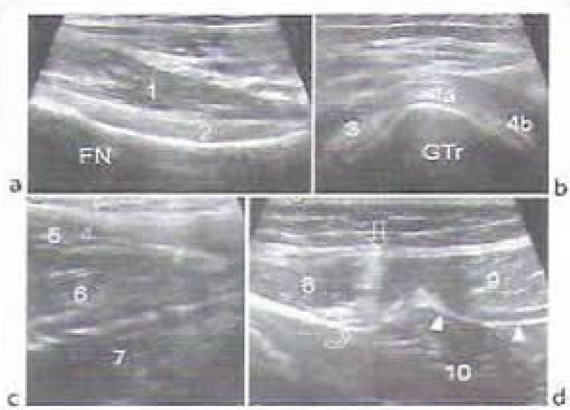


*Figure 1. Ultrasound anatomy of the hip. **a** Longitudinal US image of the anterior hip demonstrates the normal anterior joint capsule (2) lying over the femoral neck (FN) and deep to the psoas muscle (1). **b** Transverse US image over the greater trochanter (GTr) shows the insertion of the gluteus minimus tendon (3) and the anterior (4a) and posterior (4b) parts of the gluteus medius tendon. **c** Long-axis US image over the adductor origin demonstrates the tendon (arrowheads) of the adductor longus muscle (5), the adductor brevis (6) and the adductor magnus (7). **d** Transverse US image obtained just distal to the ischial tuberosity reveals the conjoined tendon (arrow) of the long head of the biceps (8) and the semitendinosus (9), the semimembranosus tendon (arrowheads), the sciatic nerve (curved arrow) and the adductor magnus muscle (10).*

UPPER LIMB NERVES: FROM NORMAL TO PATHOLOGY

Carlo Martinoli, MD

Cattedra di Radiologia - DICMI
Università di Genova, Italy

In nerve compressive syndromes of the upper limb, the diagnostic work-up is based on clinical features and electrophysiological testing that are able to assess both the level and the severity of the entrapment lesion. However, these studies do not provide information about either the status of the involved nerve and surrounding tissues that could help in determining the causes and modalities of nerve compression. Direct visualization of nerves by US may enhance both diagnosis and surgical outcome by leading to precise information on the nature of constricting findings, especially in cases with confusing or equivocal clinical pictures or contradictory electrophysiological findings. In addition, real-time US allows continuous imaging of nerves across the joints during joint movements. This evaluation takes the advantage, as opposed to MR imaging obtained either statically or with varied positioning, to better recognize intermittent nerve impingement and snapping syndromes.

A compression neuropathy may be an acute episode, intermittent and repetitive, or continuous. It may occur everywhere the nerve may be compressed or stretched by adjacent tissues within the body, but is most often encountered at specific places where the nerve is confined to narrow anatomic passageways, the osteofibrous tunnels. At these sites, nerves are particularly susceptible to constricting pressure. Whatever the nerve involved, the main US signs of nerve entrapment include changes in both nerve shape and echotexture, as a probable result of either intranervous edema and venous congestion or fibrosis, and increased depiction of intra- and perineural flow signals at color Doppler imaging as an expression of inflammatory hyperemia. The nerve shape changes consist of abrupt flattening of the nerve at the compression site and fusiform hypoechoic swelling at a more proximal level. On the basis of these features, US is an accurate means to identify the exact level of compression as located just ahead of the swollen portion of the nerve. When the nerve is too small to be detected, US may identify indirect signs of nerve lesion by demonstrating the atrophy of the innervated muscles, based on their loss in bulk and increased reflectivity due to fatty replacement.

In the upper limb, the most common sites of nerve compression that are amenable to US examination are: 1) the spinoglenoid-supraspinous notch area in the posterior shoulder for the suprascapular nerve; 2) the quadrilateral space for the axillary nerve; 3) the spiral groove of the humerus for the radial nerve, the supinator area at the elbow for the posterior interosseous nerve and the wrist for the superficial branch of the radial nerve; 4) the cubital and Guyon tunnels for the ulnar nerve; 5) the middle forearm for the anterior interosseous nerve and the carpal tunnel for the median nerve.

1. At the posterior shoulder, the suprascapular nerve may be compressed against the floor of the supraspinous and infraspinous fossa of the scapula by ganglion cysts expanding on the posterior aspect of the shoulder. Most of these ganglia result from extrusion of joint fluid through a tear of the posterior labrum. The suprascapular nerve may be visualized with US in the spinoglenoid notch adjacent to the suprascapular artery. US may also exclude tendon rupture by active and passive movements of the affected extremity. Needle aspiration of the ganglion can be attempted with US.

Muscle denervation patterns: A combined atrophy of supraspinatus and infraspinatus muscles occurs if the ganglion develops in the supraspinous notch, whereas an isolated atrophy of the infraspinatus muscle arises from expansion of the ganglion in the spinoglenoid notch.

2. Another critical area for nerve entrapment syndrome around the shoulder is the quadrilateral space. This space is bounded by the teres minor, the

teres major, the long head of the triceps and the humeral neck, and contains the axillary nerve. This nerve ends in two branches: anterior (anterior deltoid muscle) and posterior (teres minor muscle and posterior deltoid muscle). Stretching injures or fibrous bands in the quadrilateral space can lead to the entrapment of the axillary nerve just distal in relation to the anterior branch. The nerve is very small to be examined with US, but the selective atrophy of the innervated muscles in absence of a tendon tear may support the hypothesis of a nerve lesion. Color and power Doppler imaging of the posterior circumflex artery can help to identify the adjacent axillary nerve.

Muscle denervation patterns: Selective atrophy of the teres minor and deltoid muscles.

3. At the middle arm, the radial nerve winds closely around the shaft of the humerus in the spiral groove passing between the heads of the triceps muscle. At this site, the nerve may be compressed by a displaced humeral fracture and, in a postoperative setting, by either a hypertrophied callus or the compression plate of the osteosynthesis. At US the compressed nerve may appear stretched and displaced. In some cases, it may be swollen and hypoechoic. At the lateral elbow, the nerve divides into a superficial cutaneous sensory branch and a deep motor branch, commonly referred to as the posterior interosseous nerve. US can visualize the divisional branches of the radial nerve and can follow the posterior interosseous nerve as it pierces the supinator muscle, passing between the superficial and deep parts of this muscle (supinator tunnel). At this site, the posterior interosseous nerve may be compressed by a variety of space-occupying lesions, such as lipomas and ganglia, or by the fibrous bands, leading to focal changes in nerve shape and echotexture. The superficial branch of the radial nerve can be entrapped at wrist (Wartenberg syndrome). Clinically, this condition may be easily confused with de Quervain disease. Nerve abnormalities can be identified with US at this site.

Muscle denervation patterns: Radial nerve injury at the mid humeral level produces denervation of the brachioradialis muscle and the dorsal forearm muscles. An injury in the supinator tunnel results in weakness of wrist and finger muscles.

4. At the medial elbow, the ulnar nerve lies in the cubital tunnel, an osteofibrous tunnel formed by a groove between the olecranon and the medial epicondyle and bridged by a fascial sheet - the Osborne retinaculum - that continues downward to form an aponeurotic arch between the ulnar and the humeral heads of the flexor carpi ulnaris muscle. During flexion and extension of the elbow, the cubital tunnel changes shape and volume, and a traction-related flattening and elongation of the nerve occurs as the elbow flexes. On transverse US scans, the ulnar nerve is visualized throughout the cubital tunnel as an ovoid structure closely located to the medial epicondyle. The nerve may be compressed at either the condylar groove or at the edge of the aponeurosis of the flexor carpi ulnaris by bony spurs in the condylar groove, heterotopic ossification, thickening of the medial collateral ligament, anomalous anconeus epitrochlearis muscle, loose bodies, ganglia or deformities from previous elbow fractures, including cubitus valgus. US demonstrates an abrupt flattening and displacement of the nerve within the tunnel in association with abnormalities of adjacent structures. If the Osborn retinaculum is loose or absent, dynamic examination during progressive elbow flexion can depict the intermittent dislocation of the nerve over the epicondyle. This condition accounts for approximately 16%-20% of healthy subjects and is usually asymptomatic. It may be associated with snapping sensation and discomfort while the flexed elbow touches the table. However, in a few cases, the repeated friction of the ulnar nerve against the epicondyle can cause chronic damage and functional deficit. Dislocation of the medial head of the triceps - the so called "snapping triceps syndrome" - can also occur in combination with dislocation of the ulnar nerve. At wrist, the ulnar nerve passes between the pisiform bone and the hamate hook, through the Guyon tunnel. Ganglion cysts

related to the pisotriquetrum joint space, accessory muscles, and pseudoaneurysms of the ulnar artery are common causes of nerve entrapment at this site. In addition, chronic external pressure caused by repetitive use of tools during manual work or sporting activities in which chronic stress is applied on the ulnar aspect of the volar wrist can lead to nerve damage.

Muscle denervation patterns: Different clinical syndromes may result from compression of the ulnar nerve depending on the site of the lesion. Weakness of all ulnar-innervated hand muscles with sensory loss in the distribution of the sensory branch occurs when the nerve is compressed above or within the Guyon tunnel. More distal lesions may lead to either motor or sensory symptoms depending on the selective involvement of the motor or sensory branch.

5. Above the wrist, the median nerve may be compressed in the pronator area as it passes below the pronator teres muscle and the proximal aponeurosis of the flexor digitorum superficialis. The anterior interosseous nerve may also be compressed by fibrous bands arising in the pronator area or anomalous muscles in the forearm. US signs of such rare entrapment (Kiloh-Nevis syndrome) relate to the atrophy of the innervated muscles. In most cases, the cause for the nerve lesion may not be found. Compression of the median nerve at the carpal tunnel is the most common entrapment neuropathy. The main US findings of carpal tunnel syndrome include changes in shape and echotexture of the median nerve and abnormalities in the transverse carpal ligament and the soft-tissue structures hold within the tunnel. An abrupt nerve shape change at the entrance of the carpal tunnel, commonly referred to as the "notch sign", is typically observed **(Fig. 1)**. Since the nerve shape is variable through the tunnel, some indexes have been introduced with US to better quantify abnormal findings in nerve morphology: among these, a nerve cross-sectional area >10mm2 calculated at the proximal carpal tunnel (scaphoid-pisiform level) by means of the ellipse formula [(maximum AP diameter) x (maximum LL diameter) x (/4)] has been reported to be the best diagnostic criterion for the diagnosis. Extrinsic causes for nerve entrapment can be identified with US. Most patients with carpal tunnel syndrome are affected by tenosynovitis of flexor tendons. Then, a variety of space-occupying lesions can be encountered within the carpal tunnel, including ganglion cysts, anomalous muscles and anomalous bone.

Muscle denervation patterns: In an isolated anterior interosseous neuropathy, signs of muscle atrophy are limited to the flexor pollicis longus, flexor digitorum profundus and pronator quadratus muscles, leading to difficulties in performing pinching movements with the fingers. In the carpal tunnel syndrome, pain and paresthesias in the wrist and hand, often occurring during sleep or on walking, are the leading symptoms. Atrophy of the thenar eminence due to wasting of intrinsic hand muscles is a late sign of disease.

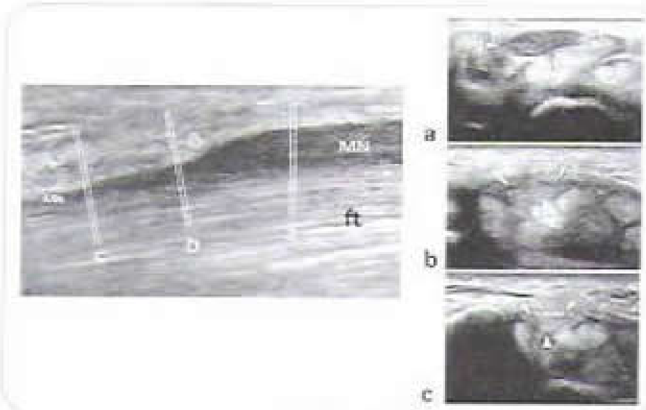


Fig. 1. Carpal tunnel syndrome. On the left, long-axis extended field-of-view 17-5MHz US image through the ventral wrist demonstrates the median nerve (MN) which appears increasingly swollen and hypoechoic with absent fascicular pattern as it progresses towards the carpal tunnel. At the proximal carpal tunnel level, an abrupt change in the nerve size, the notch sign (arrow), indicates the compression point. More distally, at the distal carpal tunnel, the nerve is flattened. ***a-c*** *Transverse 17-5MHz US images obtained* ***a*** *at the distal radius,* ***b*** *at the proximal carpal tunnel (scaphoid-pisiform level) and* ***c*** *at the distal carpal tunnel (trapezium-hamate level) according to the reference bars shown in the longitudinal image shown on the left.* ***a*** *A swollen hypoechoic medijan nerve (arrowheads) is observed at the distal radius. By comparing this image with* ***b***, *a sudden change in the nerve CSA can be seen at the point where the nerve gets deep to the transverse carpal ligament.* ***c*** *At the distal tunnel, the nerve CSA is even smaller than that seen in* ***b.***

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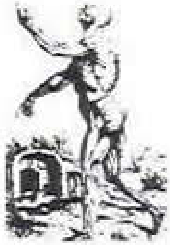

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H.T. Harcke, MD
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E. Naredo, MD
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M. Valle, MD
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P. O'Connor, MD
ENGLAND
A. Iagnocco, MD
ITALY
E. Cerezo López, MD
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G. Arancibia, MD
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D. Terriza rueda, MD
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J . Barile, MD
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G. Bevolo, MD
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E . Naredo, MD
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J . J . Mendoza, MD
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M. A. Dipietro, USA	MD
J. A. Bouffard, USA	MD
P. Kolowich, USA	MD
D. L ee, USA	MD
R. Campani ITALY	MD
A. Iagnocco, ITALY	MD
C. Martinoli ITALY	MD
E. Cardinal CANADA	MD
H. T. Harcke USA	MD
P. Peetrons, BELGIUM	MD
G. Monetti, ITALY	MD
R. Chhem, CANADA	MD
P. O'Connor, ENGLAND	MD
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I. Möller SPAIN	DO
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J. Barile BRAZIL	MD
J. Monres BRAZIL	MD
G. Azulay ARGENTINA	MD
L. Blumenthal ARGENTINA	MD
C. Capiel ARGENTINA	MD
J. Castellini ARGENTINA	MD
F. Fernández Marrero ARGENTINA	MD
J. Herrero ARGENTINA	MD
A. Rolón ARGENTINA	MD
M. J . Rodríguez ARGENTINA	MD
H. Schinder ARGENTINA	MD
G. Espada ARGENTINA	MD

Tuesday 10/21/08
Registration - Hands - On workshops and live demo sessions: 10 am 12 NOON

Basic course
Tuesday 10/21/08
1:00 pm Introduction
M. A. Dipietro, MD (USA)
President J. Herrero (ARGENTINA)

1:15	pm	Shoulder	Anatomy	P. Kolowich
			Normal US	A. Bouffard
			Common Pathology	A. Bouffard
			Live Demo	M. van Holsbeeck
2:30	pm	Elbow	Anatomy	P. Kolowich
			Normal US	R. Chhem
			Common Pathology	J. J. Mendoza
			Live Demo	D. H. Lee
3:30	pm		Coffee Break	
4:15	pm	Wrist	Anatomy	P. Kolowich
			Normal US	G. Azulay
			Common Pathology	C. Martinoli
			Live Demo	P. Peetrons
5:30	pm		End of the session	

Basic Course
Wednesday 10/22/08 Mod.: P. Peetrons, MD (Belgium)
President F. Fernández Marrero (ARGENTINA)

8:00	am	Hip	Anatomy	P. Kolowich
			Normal US	M. Valle
			Common Pathology	C. Pineda
			Live Demo	M. van Holsbeeck
9:30	am	Knee	Anatomy	P. Kolowich
			Normal US	R. Campani
			Common Pathology	G. Arancibia
			Live Demo	P. O´Connor
10:00	am		Coffee Break	
10:30	am	Ankle	Anatomy	P. Kolowich
			Normal US	H. Schinder
			Common Pathology	A. Rolón
			Live Demo	D. H. Lee
12:00	pm	Musculoskeletal Infection in Peds		H. T. Harcke
				M. A Di Pietro
12:30	pm	Juvenile rheumatoid arthritis		L. Blumenthal
		Juvenile arthritis idiopathic		G. Espada
12:45	pm	Knee Osteoarthritis		C. Pineda

1:00	pm	Lunch
2:00	pm	Hands On
3:30	pm	Coffee Break
5:30	pm	End of the session

Advanced Course
Thursday 10/23/08 Mod.: D. Lee, MD (USA)
President: A. Rolón (ARGENTINA)

8:00 am	Correlation between MRI and ultrasound Arthritis	E. Naredo
8:15 am	Role of ultrasound in osteoarthritis	A. Iagnocco
8:30 am	Upper limb nerves from normal to pathology	C. Martinoli
8:45 am	Lower limb nerves: from normal to pathology	M. Valle
9:00 am	Tendon hypervascularization why and when	P. O´Connor
9:10 am	Subacromial impingement	E. Cardinal
9:20 am	Posterior shoulder impingement	M. van Holsbeeck
9:40 am	Rotator cuff	A. Bouffard
9:50 am	What does MRI contribute in lesions of the rotator cuff	C. Capiel
10:00 am	A. C. joint instability shoulder	P. Peetrons
10:30 am	Coffee Break	
11:00 am	Enthesis and enthesitis	F. F. Marrero
11:15 am	Latest in US - contrast agents in soft tissue tumors and other possible applications	R. Campani
11:30 am	Physical principles of doppler and its main applications in musculoskeletal and softs tissues	G. Arancibia
11:45 am	Rheumatoid arthritis evaluation with ultrasound	M. J. Rodriguez
11:55 am	Upgrade in basic clinical maneuvers and pathology ultrasound	G. Azulay
12:05 pm	Palmar and plantar plates	C. Martinoli
12:20 pm	Ultrasound plantar fascitis	J. Barile
12:30 pm	Ultrasound approach carpal tunnel Syndrome	J. Monres
12:45 pm	Quiz	
1:00 pm	Lunch	
2:00 pm	Hands On	
3:30 pm	Coffee Break	
5:30 pm	End of the session	

Friday 10/24/08 Mod.: P. O´Connors, MD (England)
President M. Tortos a (ARGENTINA)

8:00 am	Anterior hip impingement	M. Van Holsbeeck
8:15 am	Brachial Plexus: from normal to pathology	G. Monetti
8:25 am	3D and 4D in MSUS	G. Monetti
8:35 am	Interventional: tutorials and applications	W. Shiels
8:55 am	Us treatment of rotator cuff calcifications	E. Cardinal
9:15 am	Lumps and bumps around the knee	R. Chhem
9:25 am	Soft tissues ambulatory ultrasonography (just images)	J. Herrero
9:35 am		
10:00 am	Coffee Break	
10:30 am	Sonographyc guidance of DDH treatment	T. Harke
11:00 am	Pediatric foot	M. Dipietro
11:20 am	Pediatric spine	M. Dipietro
11:40 am	Discussion on peds	
12:00 pm	Morton´s neuroma	J. Castelini
12:15 pm	Diabetic neuropathy syndrome	D. H. Lee
12:30 pm	Muscular Strain: its identity in ultrasound	A. Rolón
12:45 pm	Interpretation session	
1:00 pm	Lunch	
2:00 pm	Hands On	
3:30 pm	Coffee Break	
5:30 pm	End of the session	

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Electronic Posters and Abstract
M. T. van Holsbeeck, MD (www.musoc.com)

- 3.5 days course with 1.5 days on basic topicand 2 days on advanced focused lectures .
- 3 basic and advanced hands on sessions including interventional MS
- US hands on experiences and new fields of investigation.
- Beginning of the course: Tues day Oct. 21, 2008 at 1.00 pm.
- End of the course: Friday Oct. 24, 2008 at 5.30 pm.
- Discounted fees for posters and papers accepted by the Organizing
- Committee (electronic submission is open through the registration form).
- Diploma of Musculos keletal Ultras ound Society and Argentine Ultrasound Society.

***Simultaneous translation English / Spanish**

THE 3D-4D MUSCULOSKELETAL ULTRASOUND

G. Monetti1, P. Minafra 2

1Istituto di Medicina dello Sport - Università degli Studi di Bologna - Italy
2 Istituto di Radiologia - Università degli Studi di Pavia - Italy

Objectives

The study aims to assess the possible applications of ultrasound volumetric reconstruction in musculoskeletal pathologies, where both anatomical peculiarity that the complexity of the disease, up to now limit the ultrasound examination to certain specific indications.

Materials and methods

92 patients aged between 12 and 78 years (56 men and 36 women) with various kinds of musculoskeletal diseases traumatic, chronic degenerative, or following post-traumatic - were examined with ultrasound probe linear multi-volume (up to 16 Mhz) **Fig.1**, but not before to have performed an evaluation through normal two-dimensional ultrasound and magnetic resonance, in attempt to appreciate what actually examining 3D-4D was able to add to the study in B-mode. **Fig. 2-3-4.**
In a preliminary phase were performed volume reference of the various joints on normal subjects.

Results

In all subjects was possible to reconstruct anatomical structures usually inaccessible not only to ultrasound evaluation in B-mode, but also with magnetic resonance **Fig. 5-6.** In the assessment of trauma muscle and tendon, where the ultrasound examination is universally recognized as methodical elective, the volumes had always provided important information about the exact extent of injury, indicating also after reworking in post-processing, the exact size of damaged tissue **Fig 7-8**. Where it was necessary to a surgical approach, as in the case of injuries of the Achilles tendon, such information were actually allowed a very accurate pre-surgical assessment **Fig. 9.**

Conclusions

The reconstruction volumetric ultrasound in the pathologies of musculoskeletal apparatus certainly enhances the potential of the method in all those conditions for which the 2D ultrasound method is considered elective, placing itself as a valuable support in both diagnostic phase - in agreement with MRI and the traditional radiology - which in clinical follow-up-therapeutic. This innovative method in fact has allowed a much deeper even very complex anatomical locations, defining even more accurate injuries marked with the examination standards. This has undoubtedly facilitated the prognostic assessment, particularly during muscle trauma, where it was able to determine the exact area of parenchymal substance missing in the harmed muscle.

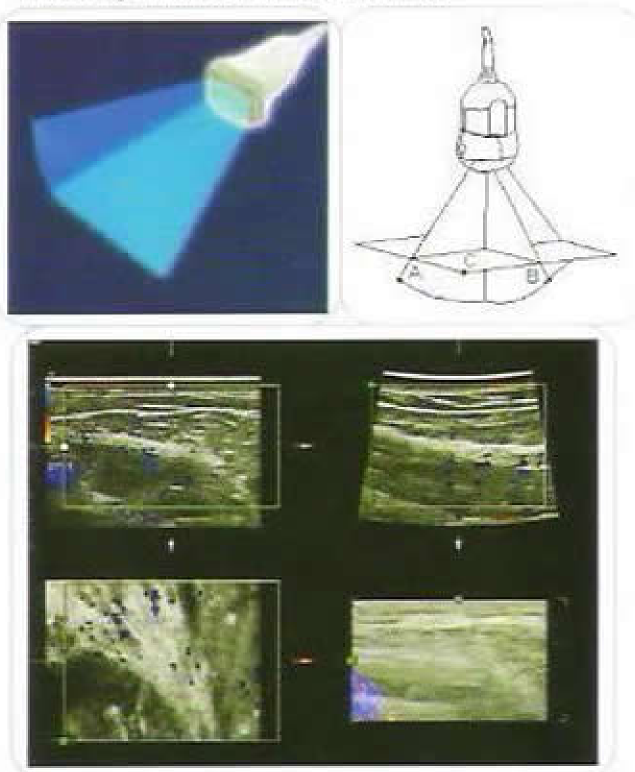

Fig. 1 - brachial plexusreconstruction with 3-d ultrasound

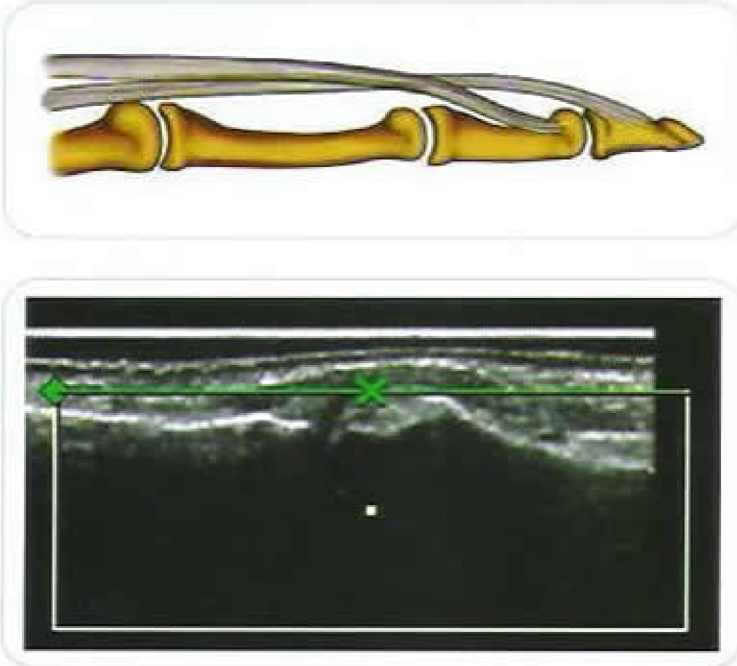

FIG. 2 - NORMAL DEEP FLEXORTENDON VISUALIZED WITH B-MODE ULTRASOUND

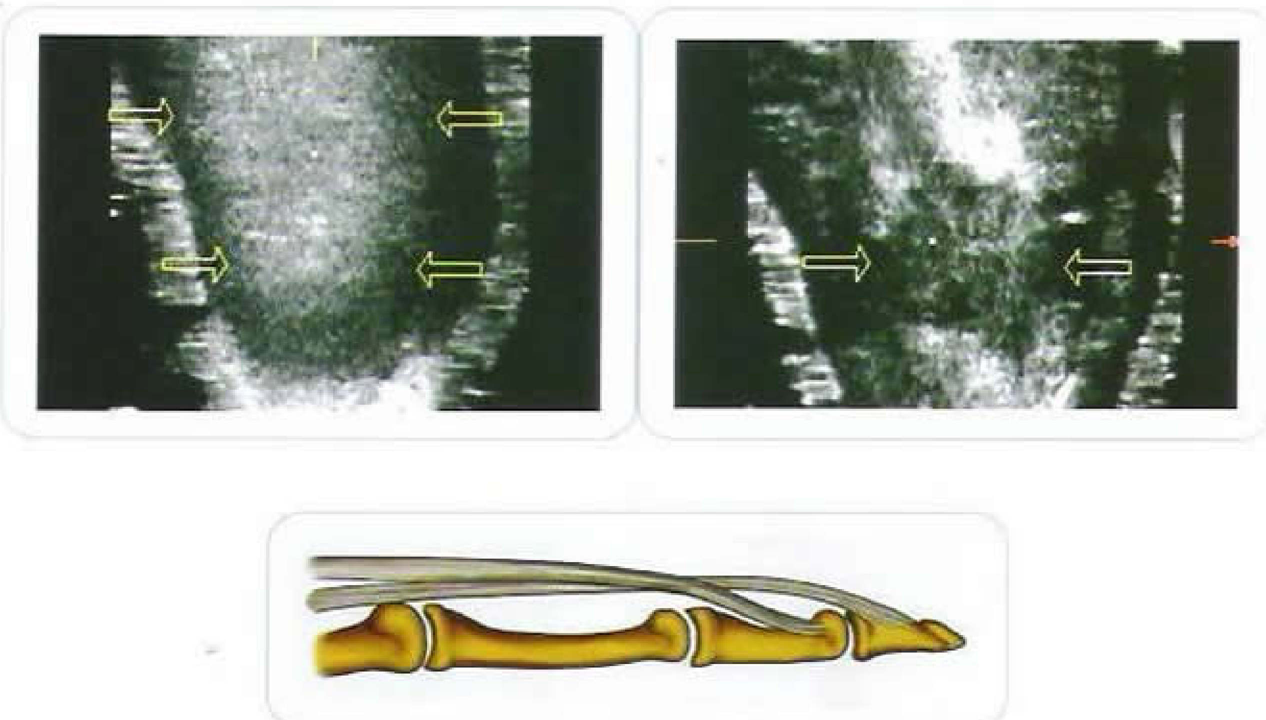

FIG. 3 - NORMAL DEEP FLEXORTENDON VISUALIZED WITH 3-D ULTRASOUND

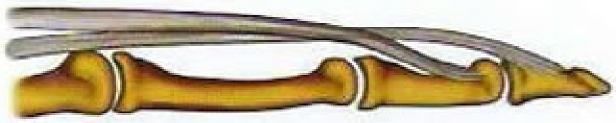

FIG. 4 - NORMAL DEEP FLEXOR TENDON VISUALIZED WITH MR

FIG. 5 - ANULAR LIGAMENT (1) VISUALIZED WITH 3-D ULTRASOUND

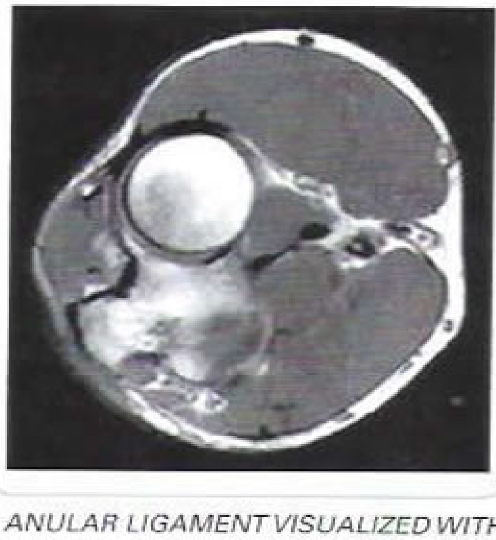

FIG. 6 – ANULAR LIGAMENT VISUALIZED WITHH MR (1).

FIG. 7 – SUB-TOTAL RUPTURE TO THE SPRING-LIGAMENT VISUALIZED WITH MR (A) AND WITH 3-D ULTRASOUND (B).

FIG. 9 – RECONSTRUCTION TO THE ACHILLE'S TENDON VISUALIZED WITH B-MODE (A) AND WITH 3-D ULTRASOUND (B).

ACROMIOCLAVICULAR JOINT INJURY: ENHANCED TECHNIQUE OF EXAMINATION WITH DYNAMIC MANEUVER

Philippe Peetrons, MD, Justine P. Bédard, MD

Hopitaux IRIS sud, Centre hospitalier Moliére-Longchamp 142, rué Marconi, 1190 Brussels, Belgium *Received 15 April 2006; accepted 18 January 2007*

ABSTRACT:

Acromioclavicular (AC) sprains can be graded in 3 to 6 different types according to Tossy or Rockwell, respectively. In mild sprains (Tossy and Rockwell I), movements in the AC joint are minimal, because the coraco-clavicular ligaments are intact. In these patients, stress radiography is usually normal, and sonographic examination at rest can be normal as well, showing minimal or no displacement be-tween the 2 extremities of the bones. We present a simple dynamic maneuver to enhance the diagnosis of these mild sprains known as the cross-arm maneuver, in which the hand is placed on the opposite shoulder. The dynamic sonographic examination dur-ing this maneuver clearly shows abnormal movements in the clavicle's extremity, which "falls down" to the acromion in the cross-arm position and is raised and pulled from the acromion at rest. The maneuver is very easy to perform and may be useful when a mild AC joint sprain is suspected.
 J Clin Ultrasound 00:000-000, 2007; Published online in Wiley InterScience (www. interscience.wiley.com). DOI: 10.1002/jcu.20339

Keywords:

acromioclavicular joint; ultrasonography

Acromioclavicular (AC) joint subluxations or dislocations account for approximately 10% of all shoulder dislocations.1 AC joint Injuries affect mostly young individuáis between the ages of 15 and 40 and are often related to athletic activities.2 Diagnosis and grading of this condition have been traditionally based on standard comparative AC joint radiographs with and without a stress test.

Sonography has been suggested in conditions reproducing those of stress radiographs.3'4 More recently, the use of MRI in diagnosis and grading of AC joint injuries has been proposed.5 The pur-pose of this article is to describe a technique of dynamic sonography as a new method of diagnos-ing AC joint injuries, which can be particularly helpful in low-grade injuries.

This article includes Supplementary Video Clips, available online at http://www.interscience.wiley.com/jpages/0091-2751/suppmat.
Correspondence to: P. Peetrons.

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ACROMIOCLAVICULAR JOINT INJURIES

Mechanisms and Clinical Presentations

Different types of forces can cause AC joint sprain. The most common mechanism is a verti-cally oriented superior impact on the lateral part of the shoulder, forcing the AC joint in a down-ward direction.2 Traction on the arm, drawing the shoulder away from the thorax or a fall on an outstretched hand with the arm in externa! rota-tion or with a 90-degree elbow flexión can also result in injuries to the AC joint.

Regardless of the mechanism, dissociation of the AC joint is the result of a sprain or a tear in intrinsic (acromioclavicular) or extrinsic (coraco-clavicular) ligaments and associated soft tissues (deltoid and trapezius muscles). A mild sprain is caused by injury to intrinsic ligaments, whereas a more severe sprain involves extrinsic ligaments and associated soft tissues. The major deforma-tion in AC joint injury is not an elevation of the distal clavicle, but a lowering of the scapula and humeras. A slight elevation of the distal clavicle still can occur in this type of injury.2

Clinical presentation varies and depends on sprain severity, ranging from a mild pain, swelling, and movement restriction to lack of arm abduction.

Grading Systems

AC joint injuries can be diagnosed with various imaging modalities. The initial classification sys-tems used a 3-grade scale based on findings on an antero-posterior radiograph of the shoulder obtained with a 15-degree cephalad angulation of the X-ray beam (Figure I).[6] The radiographic ex-amination could be completed with the use of stress radiography with a 5-kg weight strapped to each wrist. The normal distance on this view is 3-8 mm, and the distance between coracoid pro-cess and the inferior edge of the distal clavicle is 10-13 mm. The degree of increase in those dis-tances indicates the severity of the injury.

In this initial classification, a type I injury, or mild sprain, implies stretching of the AC liga-ment fibers with a normal AC relationship not apparent on radiography or only manifested by a minimal increase in AC distance.[2,7,8] A type II injury, or modérate sprain, corresponds to a dis-ruption of the AC ligament and aponeurosis of the deltoid and trapezius muscle attachments to the distal portion of the clavicle with a widening of AC distance to 1.0-1.5 cm and an increase of coraco-clavicular distance of 25-50%. The clavicle migrates superiorly less than 5 mm or 50% of the width of the clavicle on stress radiography. Finally, a type III injury, or a severe sprain, is associated with a disruption of both the AC and coraco-clavicular ligaments and muscle aponeurosis. Important widening of the AC joint (>15 mm) and widening of >50% of the coraco-clavicular distance with distal clavicle elevation of more than 5 mm or 50% of bone width is seen on stress radiography.

Subsequently, a more detailed classification consisting of 6 types of injury was introduced by Rockwood (Table I).[1,6] Recently, Antonio et al[5] applied MRI findings to this classification. Type I and II injuries were easier to detect with the use of marrow and soft tissue edema than on standard radiographs. A few studies also showed the superiority of sonography in evaluating soft tissue involvement in AC joint injuries.[9,10]

Most of the time, mild and modérate sprains are treated with conservative measures. Mouh-sine et al[11] reviewed the clinical and radiologic course of acute Tossy grade I and II sprains treated with conservative measures. A substan-tial proportion of patients (27%) developed chronic AC joint pathology requiring subsequent surgery with a mean delay from the time of injury of 26 months. Another large signifi-cant proportion of patients presented activity-related pain or antero-posterior instability. Their conclusión was that the severity of the

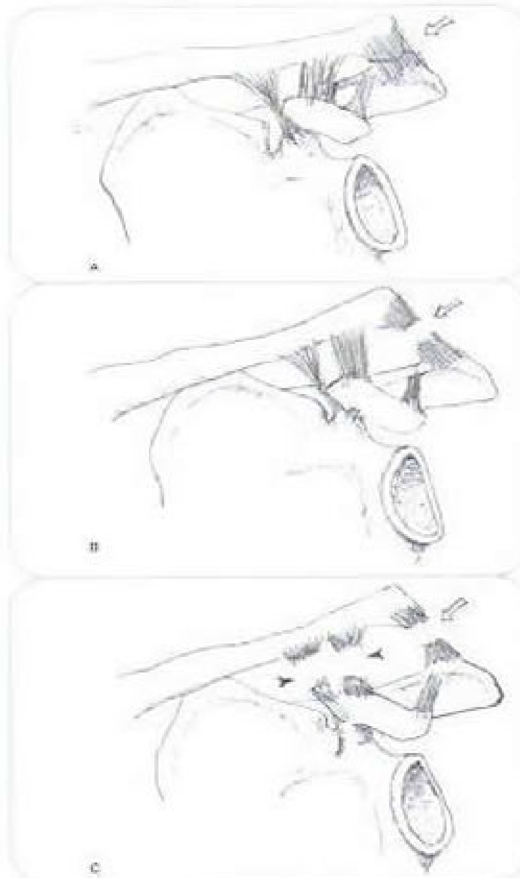

FIGURE 1. Tossy three-grade classification of AC joint injuries. (A) Grade I injury: stretching of the AC ligament fibers (arrow) with normal relationship between the acromion and the clavicle. (B) Grade II injury: disruption of the AC ligament (arrow). (C) Grade III injury: disruption of both the AC (arrow) and coraco-clavicular ligaments (arrowheads). Modifiedfrom Rockwood and Matson.6

Consequences following a grade I or II AC sprain is underestimated.

ACROMIOCLAVICULAR JOINT DYNAMIC SONOGRAPHY

The direct sonographic visualization of the AC joint including dynamic evaluation in response to arm movement is a very sensitive imaging modal-ity for mild and modérate AC joint sprains.

TABLE1

Rockwood Classification of Acromioclavicular Injuries

Type	Findings on Plain Radiographs of the AC Joint	Structural Lesions
I	Normal	AC ligament sprain, intact coraco-clavicular ligaments and deltoid and trapezius muscles
II	Minimal superior subluxation of the clavicle	AC ligament disruption, coraco-clavicular ligament sprain, intact deltoid and trapezius muscles
III	25-100% superior subluxation or dislocation the clavicle	AC ligament disruption, coraco-clavicular ligament disruption, clavicular detachment of the deltoid and trapezius muscles
IV	Posterior displacement of the clavicle	AC ligament disruption, coraco-clavicular ligament disruption, clavicular detachment of the deltoid and trapezius muscles, clavicle displaced posteriorly intoorthrough the trapezius muscle
V	>100% superior dislocation of the clavicle	AC ligament disruption, coraco-clavicular ligament disruption, more extensive clavicular detachment of the deltoid and trapezius muscles
VI	Displacement of the clavicle below the acromion orcoracoid process	AC ligament disruption, coraco-clavicular ligament disruption, clavicular detachment of the deltoid and trapezius muscles

FIGURE 2. Staticsonographicevaluation of the AC joint. Photograph shows the placement of the transducer (white line) along the axis of the joint.

FIGURE 3. Normal sonogram of the AC joint shows the acromion, clavicle, and joint capsule (arrowheads). Arrow points to the joint space.

FIGURE 4. Capsular thickening associated with traumatic involve-mentof the AC joint. Note the bulgeof the joint capsule (arrows).

Static Acromioclavicular Joint Examination

The anatomy and normal sonographic aspect of the AC joint has been well described by Ferri et al12The AC joint is composed of a thin fibrous capsule lined by synovial membrane, covered superiorly by the AC ligament and containing an incomplete fibro-cartilaginous articular disc orig-inating from the superior aspect of the joint.

The AC joint is scanned in a coronal oblique orientation with a high-frequency linear-array probé (8-15 MHz) (Figure 2). The joint space is identified as a hypoechoic gap between the clavicle and acromion, which appear on sonograms as hyperechoic lines with posterior acoustic shadow-ing. The joint is slightly wider anteriorly than posteriorly. The joint is examined to assess the alignment of bony structures, the distance between them, and the appearance of the articular capsule (Figure 3). The normal AC joint space is reported as 3.1 ± 0.8 mm, with a measurement of greater than 6 mm considered pathologic.13

Alasaarela et al14 has demonstrated the use-fulness of sonography in showing inflammation of the AC joint by an increase in the volume of the joint capsule with a distance of <3 mm meas-ured between the tip of articular capsule and superior aspect of clavicle, excluding an inflam-matory synovial process. This consideration has been extrapolated to trauma on the basis that stretching of the AC ligament will cause a capsular thickening (Figure 4). The alignment between

FIGURE 5. Cross-arm maneuver. (A) Resting position: the ¡psilateral hand is placed on the ¡psilateral knee ¡n supination. (B) Cross-arm position: the ¡psilateral hand ¡s placed on the anterior aspect of the opposite shoulder.

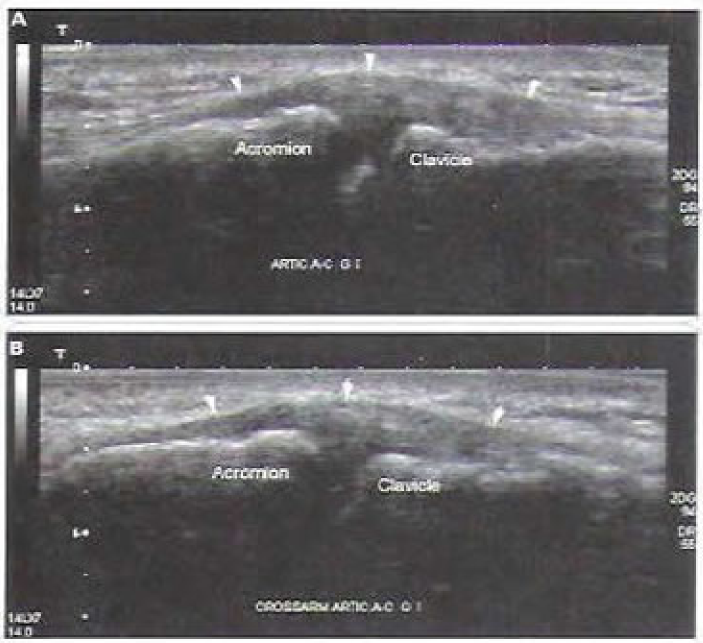

FIGURE 6. Sonograms of a normal AC joint during cross-arm maneuver. (A) Normal appearance ¡n the resting position. Note the normal dis-tance between the acromion and the clavicle and the normal capsule (arrowheads). (B) Sonogram ¡n the cross-arm position shows minimal narrowing of the joint space with no change in the capsule (arrowheads).

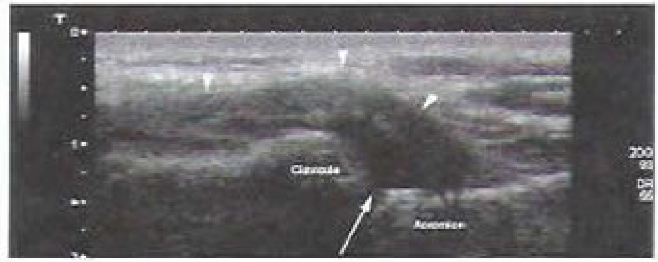

FIGURE 7. AC joint sprain. Sonogram shows bulging of the capsule (arrowheads) with contact between bony structures (arrow) during the cross-arm maneuver suggestive of injury to the articular disc.

clavicle and acromion can also be evaluated, although these findings should be compared with those obtained on the contralateral side because many anatomic variants exist for this joint.

Dynamic Evaluation of the Acromioclavicular Joint

The dynamic part of the examination is even more important in Tossy I and II lesions. It is based on a clinical sign known as the cross-arm, corresponding to a pain triggered by moving the ipsilateral hand onto the opposite shoulder.14 While the patient is sitting, the AC joint is first evaluated at rest, with the ipsilateral hand placed in supination on the ipsilateral knee (Figure 5A), which corresponds to a slight external rotation of the arm. It is then observed during the cross-arm maneuver (Figure 5B, Movie 1). The relationship between the 2 bony structures should change minimally (< 1 mm) (Figure 6, Movie 2).

If the AC ligament is stretched or torn, the dis-tance will decrease during this maneuver, with possible contact between bony structures in the case of an abnormality of cartilage or disc (Figure 7). On the other hand, when the arm is moved back to the initial position (rest), the AC distance will increase (Figure 8) (Movies 3-5). This abnor-mal gliding in coronal oblique plañe is rather typ-ical of AC ligament sprains seen in Tossy I lesions (Movie 3). The degree of bone displacement is proportional to the severity of ligament injury, a grade II injury showing more instability (Movie 4) than a grade I injury (Figure 9, Movie 3). If no displacement is observed, the probability of an AC spraineven a mild oneis small, especially if there is no capsular thickening. The sono-graphic cross-arm maneuver shows that move-ment between the clavicle and the acromion is the most probable cause for pain in the clinical cross-arm sign.

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ACROMIOCLAVICULAR JOINT INJURY

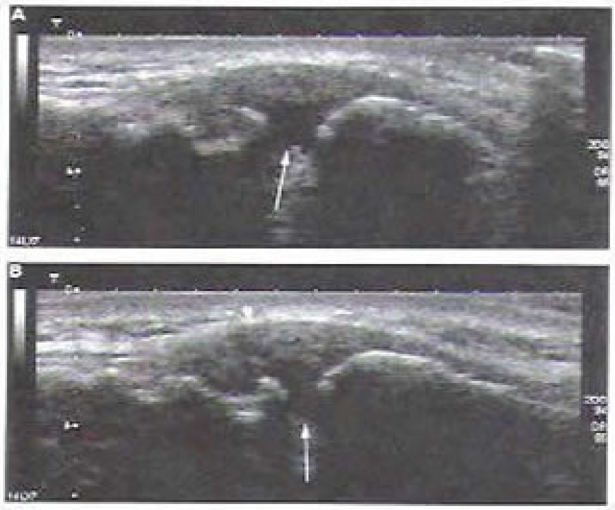

FIGURE 8. Mild AC joint sprain. (A) Resting position. Small increase in AC distance (arrow) suggests a low-grade sprain. (B) Cross-arm position. Sonogram shows a slight decrease in the distance between the acromion and the clavicle (arrow) and a slight bulge of the capsule (arrowhead) compared with panel A.

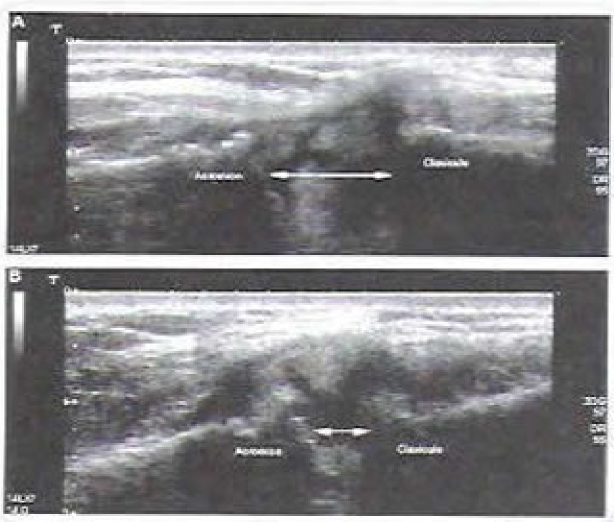

FIGURE 9. Modérate AC joint sprain. (A) Resting position. Increase in AC distance (double arrow) with echogenic capsular thickening. (B) Cross-arm position. Marked narrowing of the AC joint space (double arrow) confirms mstability. Note the bulging of the capsule (arrow-heads).

Acromioclavicular Joint Sprain Mimicker

Sonographers should be aware of the fact that osteoarthritis also can cause instability of the AC joint.14 In fact, it is thought that this common condition is caused by micro- and macro-traumas causing instability of the AC joint. However, the clinical history is somewhat different from an AC joint sprain. Findings on sonography are almost identical to those associated with an AC joint sprain, consisting mainly of a capsule thickening. In most cases, the AC distance is less than normal at rest due to degenerative changes, namely cartilage and bone erosions and osteophytes. During the cross-arm maneuver, the bony edges may come ciose together, almost "kissing" each other. However, an increase in AC distance can be seen and is caused by osteolysis of distal clavicle or by bony erosions of both the clavicle and the acromion. An arthrosynovial cyst adjacent to the AC joint can reflect a large communication between the glenohumeral and AC joints through a rotator cuff tear and bursitis.

CONCLUSIÓN

Dynamic sonography using the cross-arm maneuver is a very useful technique in the detection of mild and modérate sprains of the AC joint, which remain difficult to diagnose on radiographs.

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SACROILIAC JOINT

Andrea S Klauser:
Andrea.klauser@i-med.ac.at
Department of Radiology
Medical University Innsbruck Austria

Objective:

To demonstrate the potential of US for detection of Inflammation of Sacroiliac Joint (SIJ) and for image guided injection.

Introduction:

Sacroiliitis is a frequent and early manifestation of spondyloarthritis, including ankylosing spondylitis, psoriatic arthritis, reactive, enteropathic and undifferentiated spondyloarthropathy. As a group, the prevalence of these inflammatory spondyloarthropathies is as high as 0.5-1.9%. Detection of sacroiliitis by imaging may be essential for early diagnosis, especially because clinical diagnosis and physical examination are not very specific, leading to a delay of diagnosis for several years.
SIJ injections are a difficult procedure, because the SIJ is difficult to enter with a needle based on its complex anatomy. However, local application of intraarticular corticosteroids into the SIJ is considered as a possible additional therapeutic approach of sacroiliitis besides physiotherapy and systemic medication.
According to Rosenberg et al clinically guided intraarticular injections were successful in only 22% of the applications in a double-blind study when controlling of the needle position was done by computed tomography. Image guidance is crucial for a higher success rate of SIJ injections. Therefore image guided needle placement using fluoroscopy, CT or Magnetic Resonance Imaging (MRI) for precise needle placement have been advocated by several studies.

Materials and methods:

Demonstration of sonoanatomic landmarks and how to guide SIJ injection.
Comparison of different transverse scanning levels to guide needle insertion by US in comparison to CT were evaluated.
Demonstration how hypervascularization in the SIJ can be detected by using CDUS and can be improved by microbubble contrast administration compared to unenhanced CDUS.

Results:

Defined landmarks, as the spinous process L 5, the median and lateral sacral crest, the dorsal surface of the sacrum, the contour of the iliac crest, the posterior sacral foramen 1 and 2, the posterior superior iliac spine, the gluteal surface of the ilium could be delineated in all cases.
The hypoechoic cleft, located between the surface of the sacrum and the ilium, is the target used to guide needle insertion by US. Contrast-enhanced CDUS showed a high negative predictive value in the detection of active sacroiliitis (97 %), clearly superior to unenhanced CDUS (72 %).

Conclusions

Contrast-enhanced CDUS has shown to be a safe and a sensitive technique for the detection of active sacroiliitis. Indeed, using contrast enhanced CDUS we found an increased rate of hypervascularity in the SIJ of patients with active sacroiliitis as detected by MRI, but not in controls and patients with low back pain but normal MRI findings.
Advantages by performing US guided SIJ injections include availability, lack of radiation and that injections can be performed under real time. Bony spures can compromise US beam penetration by extensive dorsal acoustic shadowing.
Absence of radiation is especially important, as mainly younger aged patients undergo SIJ injections. Further the absence of radiation allows for repeated procedure in chronic sacroiliitis, and for contra lateral side injection.

Spur formation at the right SIJ. Please not the indentation near to the lateral sacral crest, which should not be mistaken as the joint cleft.

Preliminary results shows the feasibility of Image Fusion by using Virtual Realtime Sonography and a Navigator technology with a CT data set to guide needle insertion sonographically for intraarticular injection of the SIJ.
Needle insertion for intraarticular SIJ injection using Virtual Sonography on the basis of Image Fusion of volumetric CT data is feasible and after an initial learning curve quick to perform.
Image Fusion using a CT data set aqcuired once is valuable especially in young spondyloarthritis patients for multiple injections over time, when limited radiation exposure is desired.

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ELASTOGRAPHY: IS IT USEFUL?

Andrea S Klauser:

Department of Radiology
Medical University Innsbruck Austria

Objective:

To describe how Elastography works and t^o show its potential in MSK US.

Introduction:

Ophir et al. first described the principle of strain imaging ("elastography") in 1991. Th^is imaging method is capable of visualizing displacements between US image pairs of tissue under axial compression. In order to reduce time consuming calculations Pesavento et al. developed a fast cross sectional technique, based on real-time elastographical imaging. Maximal compression can encode in Red, minimal compression can encode in Blue, between are green and yellow.
Materials and methods:
In a preliminary study we assessed 18 Achilles tendons, Paratenon and Bursae in healthy volunteers and to compared the findings with 15 patients complaining of achillodynia with real-time sonoelastography. Tendon insertion, midportion and musculotendinous junction were examined and tendon abnormalities as thickening, focal intratendinous lesion, partial tears, calcification paratenonitis and bursitis were evaluated by a seminquantitative score of different colors representing stiff tissue (blue) to more soft tissue (green, yellow, red).

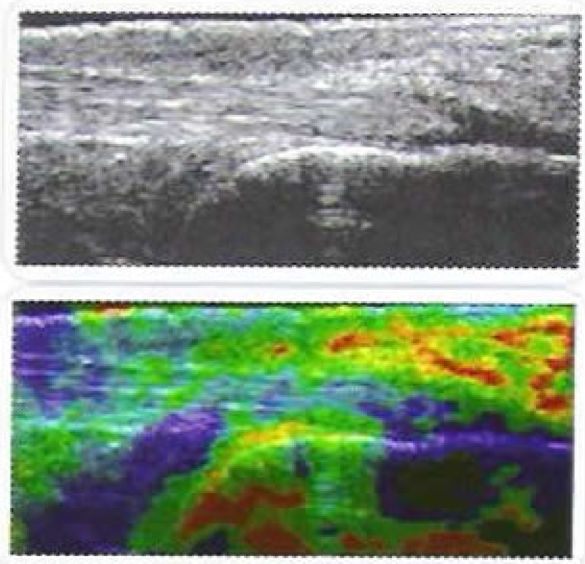
Results:

Our results showed tendons in healthy volunteers all blue colored consistent with stiff normal tendon tissue and normal findings at gray scale. Patients in 10 patients and in all patients a significant higher detection of intratendinous color alterations detected by sonoeSlastography (green, yellow, red) in comparison to gray scale US ($P < 0.001$). Comparison to healthy volunteers showed significant differences for tendon stiffness ($P < 0.0001$). Detection of tendon thickening, partial tears and peritendinous alterations showed a good correlation with gray scale US ($P < 0.001$).

Conclusions:

In conclusion Sonoelastography seems to be a sensitive method for assessment of intratendinous Achilles tendon alterations in achillodynia, compared to conventional gray scales US. As clinical relevance detection of tissue softening in achyllodynia might predict progressive tendinosis at different stages. Follow up studies or histopathology will be perforemd for further evaluation of internal alterations detected by sonoelastography in painful Achilles tendons. Further MSK applications can be of value and will be discussed, where identical gray scale values should be differentiated regarding tissue softening as allowed by using Sonoelastography.

Figures: showing normal distal third of the Achilles tendon



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PRINCIPIOS FÍSICOS DEL DOPPLER Y SUS PRINCIPALES APLICACIONES EN ULTRASONIDO MUSCULOESQUELÉTICO Y DE PARTES BLANDAS.

Dr. Germán Arancibia Zemelman

Médico Radiólogo
Hospital del Trabajador de Santiago de Chile

Introducción:

El efecto Doppler es definido como el cambio de la frecuencia de una onda sonora con el movimiento de la fuente respecto al receptor, siendo este cambio proporcional a la velocidad del reflector. Con el desarrollo del ultrasonido en medicina, se comenzaron a realizar evaluaciones vasculares de grandes vasos periféricos y cardíacas bajo esta modalidad. En los últimos años esta técnica ha sido adoptada por el ultrasonido musculoesquelético y de partes pequeñas, como complemento a la modalidad 2D.

Objetivos:

Entregar una visión general y simplificada de los principios físicos del US Doppler, así como la comprensión de cada uno de los elementos de su ecuación, mejorando así el rendimiento de las exploraciones, en sus modalidades Doppler de poder, color y espectral.
También se mostrarán algunas aplicaciones específicas en el campo del US musculoesquelético.

Material y métodos:

Se mostrarán diferentes casos en los cuales el complemento del estudio con US Doppler ha sido relevante en el diagnóstico y seguimiento.

Resultados:

En la gama de aplicaciones del US Doppler en el ámbito musculoesquelético, se observaron puntos de mayor utilidad en lo referido a la valoración de la inflamación tendinea, vascularización de masas y nódulos, así como en la relación de estos últimos con estructuras vasculares vecinas.

Conclusiones:

El US Doppler resulta ser una técnica ampliamente disponible y sencilla, de mucha utilidad como complemento al US musculoesquelético, que puede hacerse en el mismo acto y generalmente con el mismo equipo, por lo que se considera importante incluir esta evaluación rutinariamente en nuestras exploraciones
Para el médico tratante, la información entregada es de gran utilidad en la decisión y evaluación del tratamiento, así como en la elección del abordaje quirúrgico, de ser necesario.

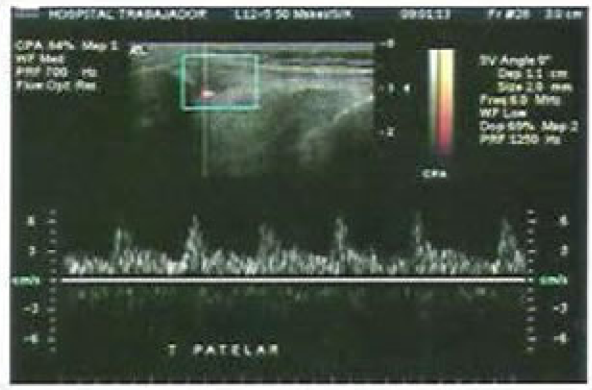

Figura 1:
Tendinosis patelar proximal con hipervascularización al Power Doppler. La curva espectral de baja resistencia es indicadora de reagudización de su condición inflamatoria.

Figura 2:
Hemangioma plantar. Evaluación con Doppler color y Power Doppler. Se observan vasos aferentes y eferentes, algunos con curvas espectrales bifásicas (arteriales de baja resistencia) y otros con curvas monofásicas (venosos).

ULTRASONOGRAPHIC APPROACH OF THE CARPAL TUNNEL SYNDROME.

Abordagem ecográfica na Síndrome do túnel carpal.

Monres José Gomes, Luis Otávio Mantovani Bataglin, Zuleika Simões dos Santos Gomes, Lara Soledad Simões Gomes. *Brazil*

OBJETIVO:

Propor uma padronização para a abordagem ecográfica na Síndrome do túnel do carpo.

INTRODUÇÃO:

O estudo da síndrome do túnel do carpo (STC) por ecografia é uma linha de pesquisa recente, visto que existem poucos trabalhos a este respeito e está em aberto porquê não há uma descrição detalhada com padroniozação e concenso entre os autores.
A avaliação da STC por ultra-sonografia vem como um moderno e versátil método, que bem executado pode trazer informações valorosas acerca deste diagnóstico.
Descrita em 1863 por Sir James Paget, a STC é a síndrome compressiva nervosa mais freqüente no corpo humano. Sua incidência predomina em mulheres na terceira até a quinta décadas de vida, sendo causada por qualquer processo patológico que reduza o diâmetro do canal do carpo ou ocasione aumento do volume das estruturas nele contidas.
Tem o seu diagnóstico baseado em dados clinicos como dor e parestesia noturna no trajeto dermático do nervo mediano na mão, além do exame físico com provas especiais como o teste de Phalen, teste de Phalen invertido e teste de Tinel.
O exame gold standard para este diagnóstico é o estudo neurofisiológico dos membros superiores. As imagens radiológicas (RX e CT) auxiliam nas mensurações do carpo e mostram alterações ósseas e calcificações. A ressonância magnética tem sido um exame de excelentes resultados sendo capaz de visibilizar os tendões flexores, o nervo mediano e sua relação com o retináculo.
Já a ultra-sonografia pode avaliar de forma dinâmica as estruturas que formam o canal do carpo e fazer mensurações que são úteis para definir o diagnóstico da neuropatia do mediano nesta topografia, bem como correlacionar com os demais achados que coadunam para o aparecimento desta síndrome.
Menos de 1% da população geral apresenta STC, entretanto no meio dos trabalhadores de risco é a mais comum e pode alcançar valores acima de 15%, representando o grande número de absenteísmo e litígio. Por estas razões modernamente é importante avaliar com acurácia a STC. Este trabalho visa propor uma padronização desta avaliação e de suas mensurações para definir a presença ou não da síndrome do túnel do carpo.

MATERIAL E MÉTODO

Foram analisadas, na Clinica Fisiogyn, Clínica São Marcelo, Hospital Goiânia Leste e Clínica Fértile Diagnósticos, na cidade de Goiânia-GO, Brasil, 42 pacientes adultas a partir da terceira década até a quinta década de vida, sendo 21 assintomáticas e 21 sintomáticas bilaterais. Foram avaliadas as dimensões do túnel carpal por meio da realização de ultra-sonografia dos punhos, além do estudo ecográfico dinâmico em transversal e longitudinal que serviu para avaliar o fibrilado dos tendões flexores e seus contornos sinoviais, bem como para estudar a relação nervo-retinacular. Os equipamentos utilizados foram ecógrafos da marca GE (General Eletric) modelo Logic-5, Logic-3 expert e Volution, contando com transdutores lineares de frequência variável de 6.0 a 12.0 MHz. O estudo foi transversal e realizado análise comparativa e estatística dos dados pela metodologia de análise de variância para as variáveis continuas e o teste de Fischer para as variáveis discretas, o nível de significância foi fixado em 95% de confiança.

RESULTADOS

Os resultados provenientes da análise ecográfica do carpo, na qual foi mensurada a distância transversal proximal média (entre o tubérculo do escafóide e o pisiforme); a distância ântero-posterior proximal média (entre a face anterior do retináculo flexor e a face anterior dos ossos do carpo); distância transversal distal média(entre o tubérculo do trapézio e o hâmulo do hamato); a medida da área de secção transversal do nervo mediano no segmento entre o tubérculo do escafóide e o osso psiforme; avaliação transversal dinâmica dos tendões flexores; avaliação dinâmica longitudinal da relação nervo-retinacular serão representados a seguir (tabela 1). As variáveis que apresentarem diferença estatisticamente significante em ambas as mãos para os grupos sintomáticos e assintomáticos foram a distância ântero-posterior, a área de secção transversal do nervo mediano e a espessura do retináculo ($p < 0,001$). Houve diferença significativa também na avaliação da zona de compressão neural e hipervisibilidade dos tendões flexores em ambas as mãos ($p < 0,001$ e $p = 0,001$ para mão direita, $p = 0,001$ e $p < 0,001$ para a mão esquerda, respectivamente), sendo que estiveram presentes em mais de 90% de todos os casos sintomáticos. As distâncias transversais proximal e distal não diferiram significativamente entre os grupos.

CONCLUSÕES:

1- A avaliação da área de secção transversal do nervo mediano entre o psiforme e o tubérculo do escafóide pode ser considerada atualmente como um fator de maior importância para afirmar o diagnóstico ecográfico da STC.
Valores < 0.10cm² são considerados normais.
Valores ≥ 0.15cm² são os nervos que se pode afirmar neuropatia.

2- A mensuração estrita do canal do carpo por métodos radiológicos (RX e CT) e sua relação com a etiologia desta síndrome em estados pré e pós-cirúrgicos já é bem estudada e pode ser reproduzida por ultra-sonografia com grande precisão.

3- A avaliação subjetiva em ecografia dinâmica transversal para avaliar o fibrilado e o componente sinovial dos tendões flexores e longitudinal para avaliar zonas de compressão no nervo mediano pode ser útil na conclusão do diagnóstico ecográfico da STC.

4- A simples avaliação ântero-posterior dos diâmetros do túnel carpal pode determinar presença ou não de abaulamento retinacular.

TABELAS

Variáveis	Média	Desvio padrão	Mínimo	Maximo
Direito				
Distância transversal proximal (mm)	2,56	0,31	1,85	3,09
Distância antero posterior (mm)	1,46	0,15	1,21	1,71
Distância transversal distal (mm)	1,99	0,19	1,66	2,41
Área de secção transversal (cm²)	0,19	0,05	0,12	0,32
Espessura do retináculo (mm)	0,48	0,06	0,37	0,56
Esquerdo				
Distância transversal proximal (mm)	2,61	0,28	2,06	3,12
Distância antero posterior (mm)	1,42	0,15	1,12	1,67
Distância transversal distal (mm)	1,98	0,20	1,68	2,38
Área de secção transversal (cm²)	0,17	0,04	0,11	0,32
Espessura do retináculo (mm)	0,47	0,07	0,36	0,57

Variáveis	Direito				Esquerdo			
	Nao		Sim		Não		Sim	
	Abs	%	Abs	%	Abs	%	Abs	%
Zona de Compressão neural (casos)	20	95,24	1	4,76	21	100,0	-	0,0
Hipervisibilidade dos tendoes flexores (casos)	19	90,48	2	9,52	19	90,48	2	9,52

Tabelas 1 e 2: Variáveis estudadas em relação aos grupos sintomáticos.

Variáveis	Média	Desvio padrão	Mínimo	Maximo
Direito				
Distância transversal proximal (mm)	2,49	0,28	2,05	3,02
Distância antero-posterior (mm)	1,25	0,10	1,03	1,41
Distância transversal distal (mm)	2,11	0,29	1,16	2,69
Área de secção transversal (cm²)	0,09	0,02	0,05	0,15
Espessura do retináculo (mm)	0,38	0,05	0,29	0,47
Esquerdo				
Distância transversal proximal (mm)	2,46	0,26	2,09	3,06
Distância antero-posterior (mm)	1,26	0,11	1,05	1,42
Distância transversal distal (mm)	2,11	0,29	1,14	2,58
Área de secção transversal (cm²)	0,08	0,02	0,06	0,13
Espessura do retináculo (mm)	0,37	0,06	0,27	0,45

Variáveis	Direito				Esquerdo			
	Nao		Sim		Nao		Sim	
	Abs	%	Abs	%	Abs	%	Abs	%
Zona de Compressão neural (casos)	6	28,57	15	71,43	12	57,14	9	42,86
Hipervisibilidade dos tendões flexores (casos)	9	42,86	12	57,14	8	38,09	13	61,91

Tabelas 3 e 4: Variáveis estudadas em relação aos grupos Assintomáticos.

FIGURAS

Figura 1 - Área de secção tranversal (1). Distância transversal proximal (2). Distância ântero-posterior (3).

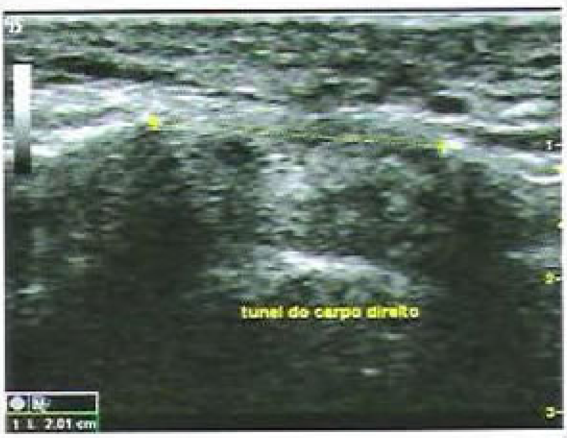

Figura 2 Distância transversal distal.

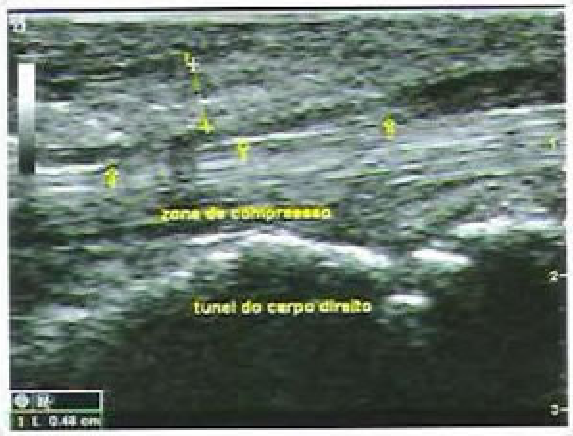

Figura 3 Relação nervo-retinacular: zona de compressão sobre o mediano (setas) e espessura retinacular (1).

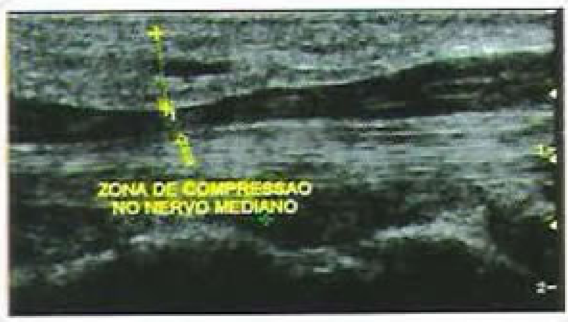

Figura 4 - Relação nervo-retinacular: zona de compressão sobre o mediano (seta) e espessura retinacular (1).

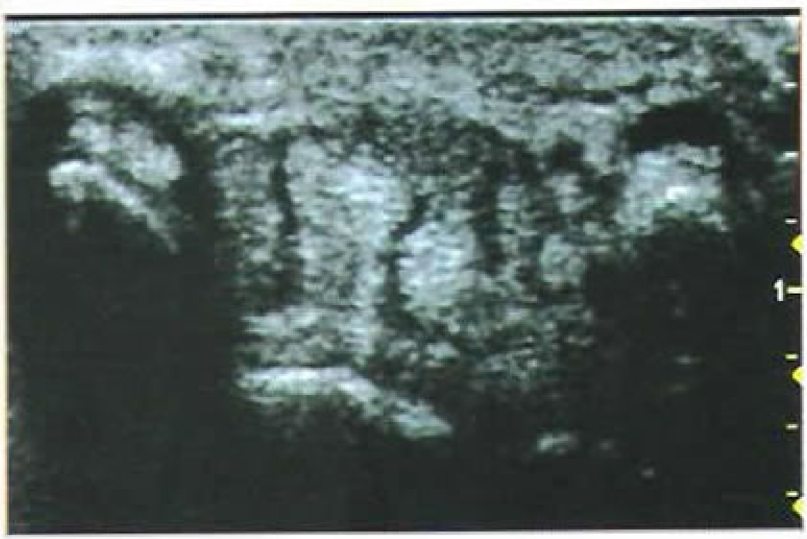

Figura 5 - Hipervisibilidade dos tendões flexores no plano transverso tendinopatia.

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National Library of Medicine, USA.

http://www.bireme.br
Biblioteca Virtual en Salud, del Centro Latinoamericano y del Caribe de Información en Ciencias de la Salud con sede en Brasil.

http://www.smschile.cl/
Sitio web de la Sociedad Médica de Santiago (Sociedad Chilena de Medicina Interna).

http://www.minsal.cl/
Portal del Ministerio de Salud de Chile.

http://www.paho.org/default_spa.htm
Sitio web de la Organización Panamericana de la Salud.

http://www.who.int/
Sitio web de la Organización Mundial de la Salud.

http://nccam.nih.gov
Sitio del National Institute of Health, USA.

Centros Académicos y de Investigación

http://escuela.med.puc.cl/
Sitio de la Escuela de Medicina de la Pontificia Universidad Católica de Chile.

http://www.med.uchile.cl/index.htm
Sitio de la Escuela de Medicina de la Universidad de Chile.

http://icbm.cl/
Sitio del Instituto de Ciencias Biomédicas de la Facultad de Medicina de la Universidad de Chile.

http://www.udec.cl/medicina/index.htm
Sitio de la Facultad de Medicina de la Universidad de Concepción, Chile.

http://www.inta.cl/
Instituto de Nutrición y Tecnología de los Alimentos, Universidad de Chile.

Publicaciones Electrónicas.

http://www.sibuc.puc.cl/sibuc/index.html
Revistas Electrónicas de Medicina y Enfermería.

http://www.med.uchile..cl/biblioteca/rchm/rchm_mayo03.htm
Revistas electrónicas del área biomédica.

http://pubmedcentral.nih.gov/
National Center for Biotechnology Information (NCBI) de la National Library of Medicine U.S.A.

http://www.freemedicaljournals.com
Sitio web de Amedeo Group.

http://highwire.stanford.edu/
Highwire Press de la Stanford University Libraries.

Bases de Datos Especializadas

http://www.ncbi.nlm.nih.gov/
National Center for Biotechnology Information de la National Library of Medicine, USA.

http://www.biomedcentral.com/
Sitio web de Biomed Central Ltd. USA .

Http://www.bireme.br/bvs/P/pbd.htm
Bireme, es un centro especializado de la OPS (Organización Panamericana de la Salud) con sede en Brasil.

Medicina Basada en Evidencia

http://www.update-software.com/clibng/cliblogon.htm
Cochrane Library: Sitio web de divulgación de las revisiones sistemáticas de la Colaboración Cochrane.

http://infodoctor.org/rafabravo/
Sitio web de información médica del Dr. Rafael Bravo Toledo.

http://www.tripdatabase.com
Metabuscador de libre acceso, mantenido por el Virtual Learning Centre y la National Electronic Library, U.K.

http://sumsearch.uthscsa.edu/espanol.htm
Health Science Center at San Antonio, University of Texas USA.

http://escuela.med.puc.cl/Recursos/MBE2001/index.html
Sitio de libre acceso para búsquedas de medicina basada en evidencias.

http://www.clinicalevidence.com
Base de datos editada por el BMJ Publishing Group.

http://www.freebooks4doctors.com/fb/index.htm
Ofrece libre acceso a libros de medicina, de texto completo.

http://www.merck.com/
Manual Merck . Editado por Merck & Co., Inc.

http://cancerweb.ncl.ac.uk/omd/
On-line Medical Dictionary: Publicado por el Dept. of Medical Oncology, University of Newcastle upon Tyne The CancerWEB Project.USA.

Listas de Interés y Grupos de Discusión

http://www.medstudent.ucla.edu/ihig/
International Health Interest Group del UCLA (Universidad de California).

http://www.mlanet.org/
Sitio de la Medical Library Association.

Temas de Actualidad

http://www.geocities.com/elmedico/genes.html
Genética en Internet.

http://www.ornl.gov/TechResources/Human_Genome/home.html
Página oficial de The Human Genome Program of the US Department of Energy.

http://www.vatican.va/roman_curia/pontifical_academies/acdlife/
Pontifical Academy for Life, página de The Roman Curia.

Directorios Temáticos

http://www.sciencekomm.at/
Medbioworld, Inc. USA mantiene este gran sitio de referencia médica.

http://omni.ac.uk/
Guia de recursos de calidad en las áreas de salud y Medicina en Internet.

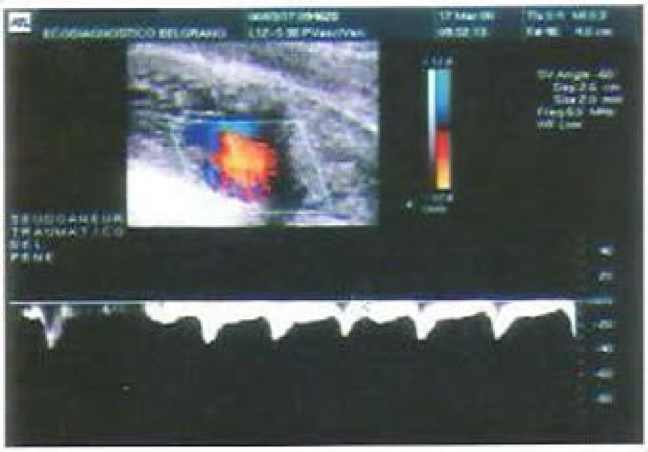
http://www.worldwidehealthcenter.net/
Directorio Especializado en medicina natural o alternativa.

http://www.conicyt.cl/becas
La Comisión Nacional de Investigación Científica y Tecnológica de Chile.

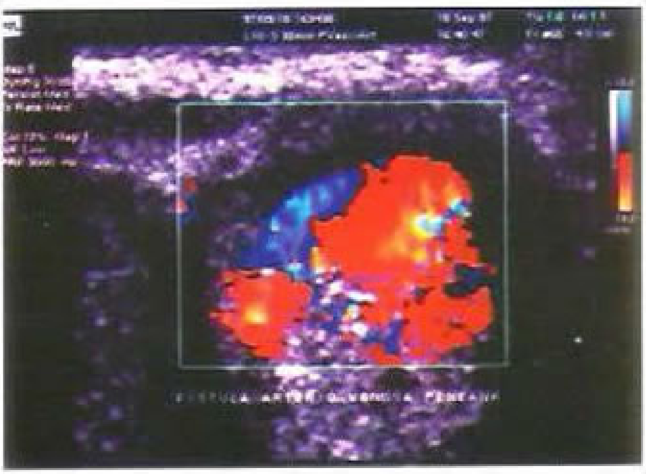
http://www.fic.nih.gov/
Sitio de la Fogarty International Centre, National Institutes of Health USA.Listas de Interés y Grupos de Discusión

ICONOGRAFIA: DOPPLER EN VASCULARIZACION DE PARTES BLANDAS

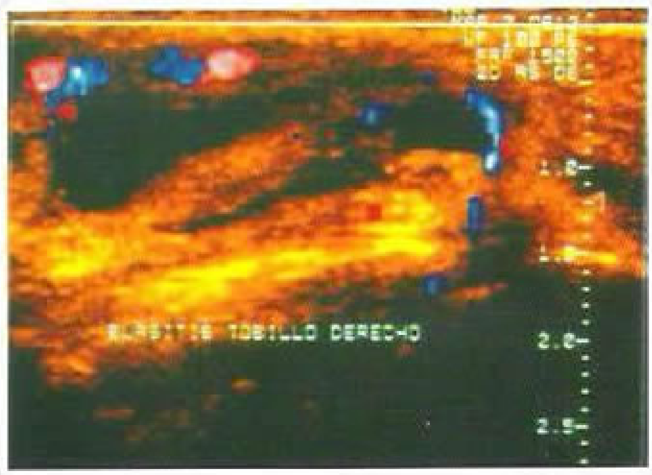
Revascularizacion



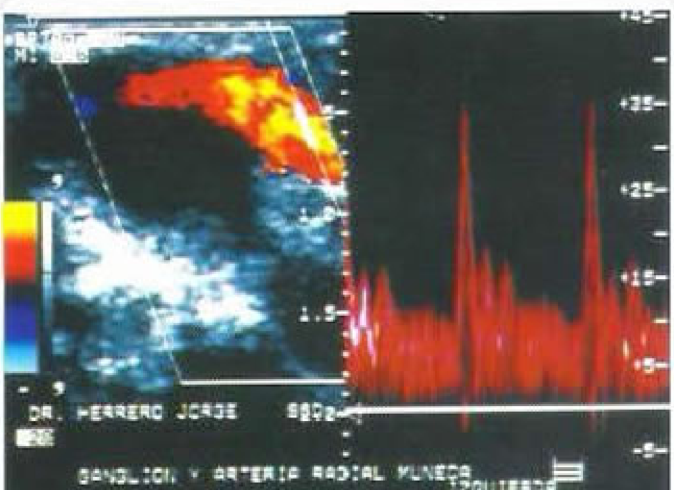
Seudoaneurisma traumatico del pene

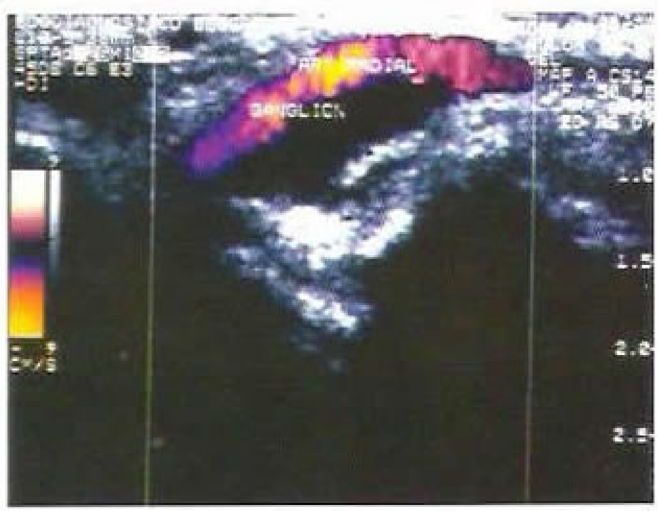


Fistula arterio venosa peneana

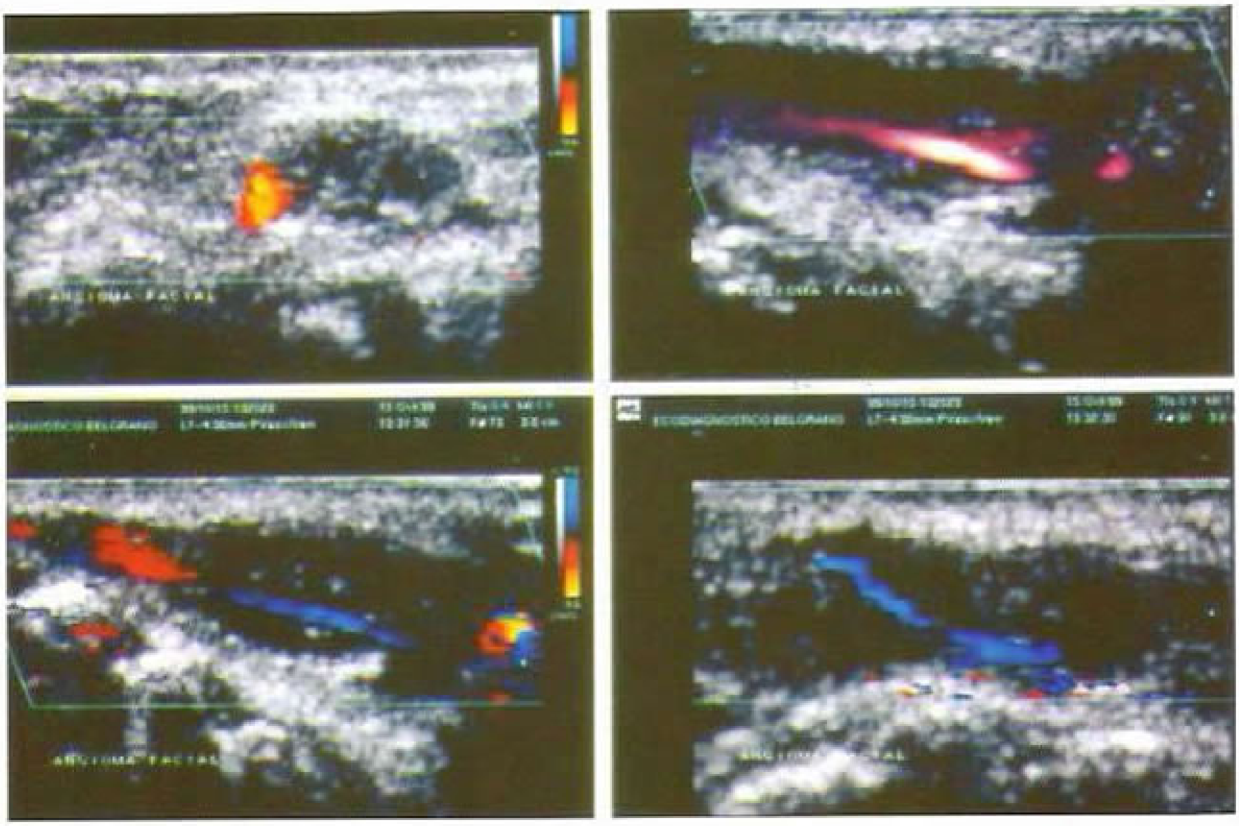


Bursitis tobillo derecho

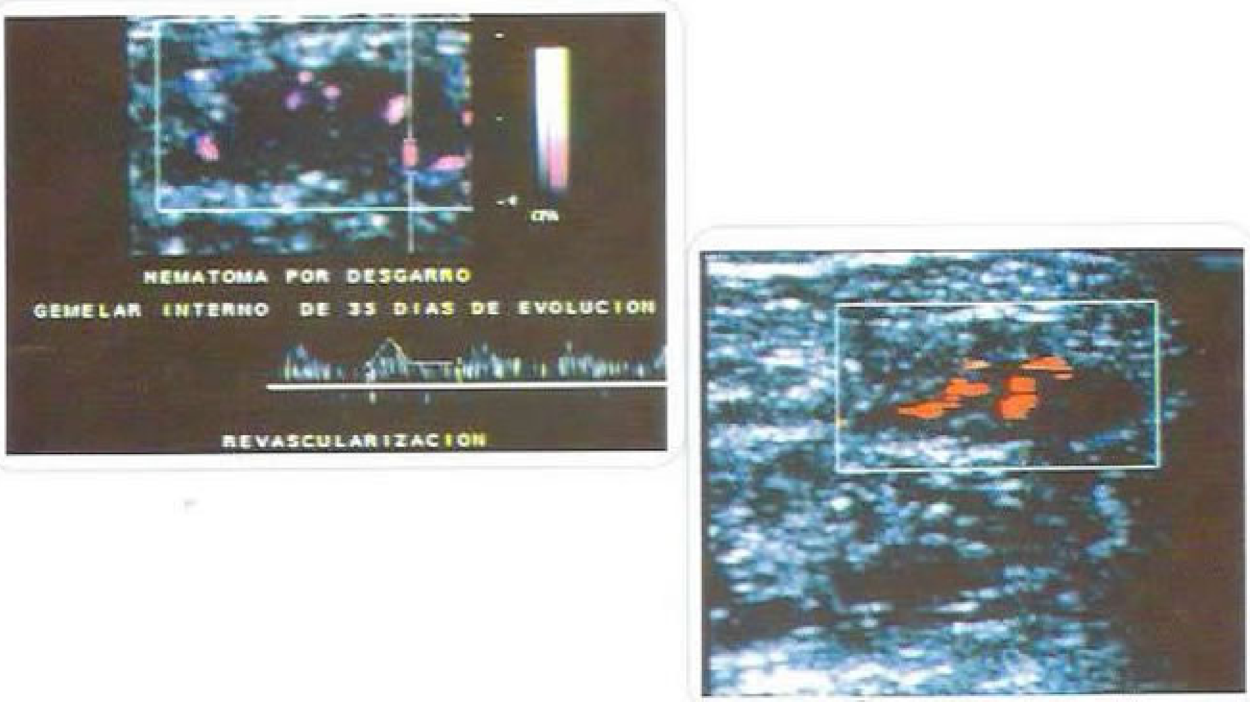




Ganglion y radial muñeca izquierda

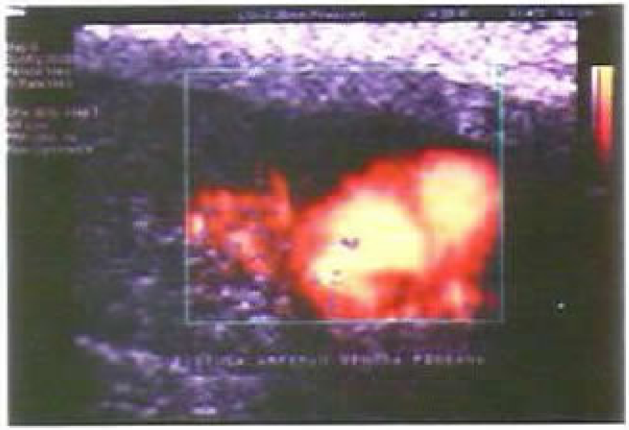


Angioma facial

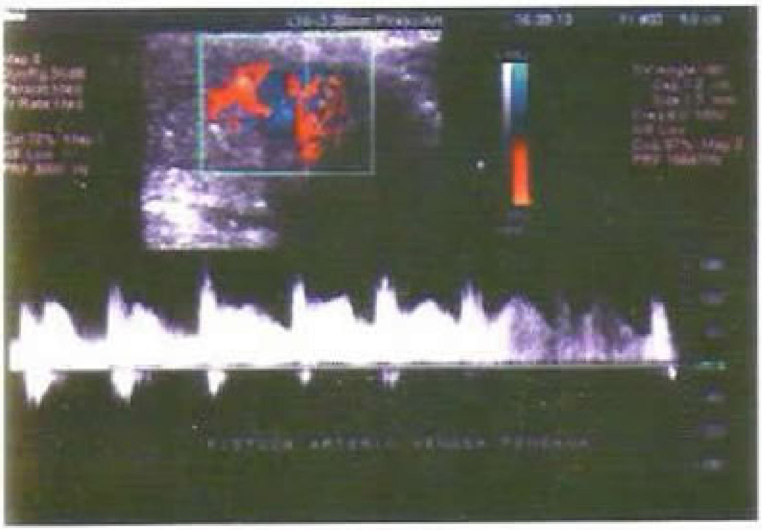


Hematoma por desgarro gemelar interno de 35 dias de evolucion
Revascularizacion

Seudoaneurisma traumatico del pene



Fistula arterio venosa peneana



Fistula arterio venosa peneana

Ganglion

Agradecemos a las siguientes empresas el constante apoyo a la SAEU que hace posible la difusión científica en su más alto nivel

ALLMEDIC S.A.
Av. Alicia Moreau de Justo 1848
Dock 14 / Of 2 / Puerto Madero
Tel. 011 4311-3765 / 4312-7140
Allmedic@allmedic.com.ar
www.allmedic.com.ar

Dian
Laboratorios Químicos Caballero, SRL
San Luis 2464
2000 Rosario, Santa Fé, Argentina
Tel / Fax +54 341 448 7173 / 424 8921 / 421 3438
email: ultragel@arnet.com.ar / lqdian@anet.com.ar / liliec@fibertel.com.ar

DIGIMED S.A.
Giribone 1002
Ciudad de Buenos Aires - Argentina
Tel. 011 4555-3322
Fax: 011 4551-8377
ventas@digimed.com.ar
www.digimed.com.ar

ESAOTE
Guayaquil 866 (C1424CAV) Buenos Aires - Argentina
Tel.: (54-11) 4902-0090
Ventas@tecnoimagen.com.ar

FABRICA ARGENTINA DE PAPELES TERMOSENSIBLES S.R.L.
Juan Agustin García 2553
Ciudad de Buenos Aires - Argentina
Tel. 011 4588-0781 / 4583-7002
Cel: 15 4475-8294 / 15 5481-1354
Fabarg_papeltermosensible@yahoo.com.ar

GRIENSU S.A.
Buenos Aires - Argentina
Tel: (54 11) 4342-8818
Infogeneral@griensu.com

GRUPO AVATECH S.A.
J. E. Uriburu 663 - piso 4-C1027AAM-
Buenos Aires Argentina
Tel: (54 11) 4951-6114/4954-0014
Fax: (54 11) 4954-3312
Ventas@grupoavatech.com.ar
Service@grupoavatech.com.ar

HITECC MEDICAL S.A.
México 3100
C1223ABL - Buenos Aires - Argentina
Tel: (54 11) 4957-8117
Fax: (54 11) 4931-6600
hittec@permint.com

PHILIPS Argentina S.A.
Vedia 3892
C1430DAL
Buenos Aires - Argentina
Tel :(54 11) 4546-7777
Fax :(54 11) 4546-7600
customerphilips@philips.com.ar

PROCREARTE S.A.
Av. Pueyrredón 768, piso 2°
Buenos Aires - Argentina
Tel/Fax: (54 11) 4961-6191
procrearte@procrearte.com

RAYOS PIMAX S.R.L.
Administración y Fábrica:
lascano 4431
(1417) Buenos Aires - Argentina
Tel: (54 11) 4567-1814
Depósito:
Sarratea 850
(1754) San Justo - Pcia. de Buenos Aires

TECNOIMAGEN S.A.
Guayaquil 866
(1424) Buenos Aires - Argentina
Tel/Fax: (54 11) 4902-0090 Rotativas