SHOULDER JOINT PATHOLOGY – IMPROVED DIAGNOSIS BY MAGNETIC RESONANCE IMAGING (MRI): A PICTORIAL ESSAY AND REVIEW

Andreas NIDECKER
IMAMED Radiologie Nordwest, Basel, Switzerland

ABSTRACT

This paper describes the personal experience of the author with Shoulder Arthro MR. This imaging method is put into perspective with other, more widely used diagnostic methods, which also have their advantages. Indications for Shoulder Arthro MR are discussed and details on the technique and interpretation are given. Furthermore a review of the spectrum of pathology in 100 consecutively examined patients is made and treatment and outcome are listed. Lastly a pictorial review of typical pathologies in MR pictures is supplemented. After x-ray, Shoulder MR is now considered the standard among the imaging methods to diagnose shoulder disorders, as it allows for optimal depiction of pathology and diagnosis in all major imaging planes. At the same time the method gives the arthroscopist an excellent roadmap for his intervention. All in all, the treatment outcome of shoulder trauma has been improved by shoulder MR in conjunction with modern surgical and arthroscopic therapies.

Key words: shoulder joint anatomy; diagnosis of shoulder joint disease; shoulder arthro-MR method; imaging of shoulder joint disease; imaging shoulder joint trauma

INTRODUCTION

The search for the cause of shoulder pain by imaging methods is usually initiated by conventional radiography. Radiography allows recognition of fractures, dislocation and degenerative joint disorders involving both the acromioclavicular and the glenohumeral joints. Also, soft tissue calcifications, result of tendon degeneration and possible cause for chronic pain are mostly well depicted in shoulder x-ray series, particularly if joints are examined in internal and external rotation and abduction. The Y-projection allows better assessment of the subacromial/subcoracoid spaces and is a logical second plane supplementing the traditional ap views [1]. Conventional shoulder joint arthrography improves the diagnosis [2, 3] as it is able to demonstrate contrast media extravasation into the subacromial/subdeltoid bursa, which is indicative of a tear of the rotator cuff. Ultrasound studies add to the diagnostic accuracy and supplement the diagnostic armamentarium of the radiologist [4-8]. With ultrasound it is possible to directly demonstrate the substance of the rotator cuff and give direct evidence of joint and bursal effusions, as well as calcifications and larger tears. Still, only with a good understanding of the shoulder joint anatomy and pathology proper diagnostic results can be obtained. With computed tomography (CT) further advances in the diagnosis are possible [9-15]. Yet the diagnostic detail of the major structures at risk in the shoulder joint, the rotator cuff and the glenoid labrum, are less easily assessed properly in plain CT and mostly contrast enhanced CT studies are performed.

While excellent summaries on the topic of imaging of the shoulder are available [16-18], this paper will focus on the personal experience of the author with magnetic resonance imaging (MRI) including intraarticular injection of Contrast Media (Arthro-MR) of the shoulder joint. In a private group practice with 9 radiologists excellent results with this method have been attained over many years, also reflected by the steady referral practice and frequency. While we believe in our diagnostic accuracy, the large number of patients sent to our institute certainly is also due to increasingly sophisticated arthroscopic techniques. This has resulted in greatly improved therapeutic results and an overall better outcome in many patients. Both a statistical review of the spectrum of pathology found in 100 consecutive patients and a rough statistics of the therapeutic outcome in this group, as well as a pictorial review of typical shoulder pathologies as seen on Arthro MR will be presented.

ANATOMY

Space does not allow a detailed description and illustration of the complex anatomy and study of the appropriate literature is suggested. In principle the glenohumeral joint is composed of the glenoid of the scapula and the humerus, with the contacting surfaced of these two bones being very small. This explains on one hand the extreme mobility of the shoulder joint, yet also the relative ease of sustaining joint luxation. It is the rotator cuff and the associated muscles which give this joint stability, while still ensuring a large motion range. The cuff is composed anteriorly by the subscapularis tendon and muscle, superiorly by the supraspinatus tendon and muscle and posteriorly by the infraspinatus tendon and muscle. These tendons in association with ligamentous reinforcements of the joint capsule by the superior, middle and inferior...
FIGURE 1. Axial sections through normal shoulder joint.
A – Anterior section; B – Middle section; C – Posterior section
1 – Acromion; 2 – Subscapularis tendon; 3 – Supraspinatus tendon; 4 – Infraspinatus tendon; 5 – Rotator interval; 6 – Coracoid process; 7 – Acromio-clavicular joint; 8 – Intraarticular portion of long head of biceps tendon; 9 – Short head of biceps muscle; 10 – Deltoid muscle; 11 – Glenoid labrum; 12 – Superior glenohumeral ligament; 13 – M. supraspinatus; 14 – M. infraspinatus; 15 – M. subscapularis; 16 – Spina scapulae; 17 – Extraarticular portion of long head of biceps tendon

FIGURE 2. Semicoronal sections through normal shoulder joint.
A – Superior section; B – Inferior section
1 – Acromion; 2 – Subscapularis tendon; 3 – Supraspinatus tendon; 4 – Infraspinatus tendon; 5 – Rotator interval; 6 – Coracoid process; 7 – Acromio-clavicular joint; 8 – Intraarticular portion of long head of biceps tendon; 9 – Short head of biceps muscle; 10 – Deltoid muscle; 11 – Glenoid labrum; 12 – Superior glenohumeral ligament

FIGURE 3. Semisagittal sections through normal shoulder joint.
A – Lateral section; B – Medial section
1 – Acromion; 2 – Subscapularis tendon; 3 – Supraspinatus tendon; 4 – Infraspinatus tendon; 5 – Rotator interval; 6 – Coracoid process; 7 – Acromio-clavicular joint; 8 – Intraarticular portion of long head of biceps tendon; 9 – Short head of biceps muscle; 10 – Deltoid muscle
gleno-humeral ligaments, the glenoid labrum and the biceps tendon are the essential soft tissue structures which assure normal function of the joint. While fractures of the glenoid and humerus are rarely seen in private practice, damage to any of the mentioned soft tissue structures is frequent and is the cause of the bulk of referrals to imaging institutions. Figures 1-3 of specific sections of the joint in the axial, semicoronal and semisagittal planes give some information on the location of relevant anatomical structures.

METHODS (TECHNIQUE OF SHOULDER ARTHRO-MR)

At our institution patients with shoulder problems are referred routinely for Arthro MR, i.e. an examination where a conventional arthrography is followed by an MR study. For this the patients are taken to the fluoroscopy room and placed in supine position. The shoulder joint region is properly disinfected and 10-15cc of a mixture of dilute Gado DOTA (ARTIREM®, Guerbet SA, France) with a few drops / 2cc of Ioxaglinic Acid (HEXABRIX®; Guerbet SA, France) are injected under fluoroscopy into the joint cavity, at a craniomedial position of the humeral head contour, lateral to the coracoid process (Figure 4). Such a mixture of an MR (Gadolinium) and an x-ray (Iodine) contrast medium allows fluoroscopic control of the proper intra-articular injection of the solution, although usually this can be also felt by a low resistance to the injection pressure on the syringe. Furthermore, with conventional arthrography a general assessment of the capsule configuration and volume is possible, e.g. a tight capsule as in adhesive or constrictive capsulitis is rapidly confirmed, although this may be already suspected clinically. For documentation a series of spots films is performed under fluoroscopy. Usually pictures are taken in neutral position of humerus, internal and external rotation, in ap projection with gently performed abduction and under axial caudal traction. The latter position to us has proven to be frequently useful, as in some rotator cuff tears the edges may be stuck together and tears only open up and are visualized upon traction. The patient is then sent to the MR machine. Even though Arthro MR transforms a noninvasive procedure into an invasive one, this type of preparation is usually well tolerated by the patients. Only those with an inflamed joint as in adhesive capsulitis do experience pain upon injection of the usual volume of contrast agent. In any case, patient comfort in the MR is very important. A restless patient under pain may produce movements during the study, which is detrimental to good image quality.

Rarely, if a purely osseous problem is being discussed, as e.g. a bone tumour or other specific questions, or in patients with iodine intolerance, we may perform direct MRI without intraarticular Gadolinium. While plain MRI is still used by many centres, we have used Arthro MR [19-21] for many years and prefer it for several reasons: First, we consider it an advantage to have the joint capsule distended by contrast-media and secondly, the fluid contrasting the soft tissue structures allows for easier conspicuity of subtle lesions. Furthermore, postoperative tendon repairs are more easily evaluated with intraarticular contrast. As we are working in private practice, we usually get only one chance to make a diagnosis in any given patient. For this reason we are interested in the optimal delineation of the soft tissues on first trial.

For shoulder MR dedicated surface coils are used on our 1.5 Tesla Scanner. Several MR pulse sequences are performed (Table 1) and the joint is usually examined in three major planes: axial, oblique coronal (semicoronal) and oblique sagittal (semisagittal) planes (Figure 5).

The axial images extend from the acromion down to the

FIGURE 4. Injection point for shoulder arthrography.
inferior glenoid rim. Semicoronal planes are used because the scapula and glenohumeral joint are oriented at an angle of approximately 45° degrees in relation to the chest. Therefore straight sagittal and coronal imaging would cut the relevant soft tissue structures obliquely. These semicoronal images are oriented parallel to the scapula and include the infraspinatus muscle posteriorly and the subscapularis muscle anteriorly. Finally semisagittal images in a perpendicular plane to the semicoronal range from the supraspinatus groove medially to the lateral aspect of the greater tuberosity. This protocol for shoulder MR studies is used routinely in most institutions. It allows for evaluation of all major soft tissue structures of the joint and a detailed MR analysis. The following pulse sequences have been found to be most revealing for depicting the anatomy in 3 planes and are performed by our group on our 1.5T scanner (Table 1).

When analyzing the pictures, we start of with the semicoronal series, searching the configuration and signal intensity of the supraspinatus tendon. This is the portion of the rotary cuff most frequently torn [22-24]. Due to its position under the acromion, it is also the cuff portion most frequently sustaining chronic injury resulting in degenerative tendinosis (Figure 6). Also the acromio-clavicular joint is well seen in the semicoronal position and so is the long head of the biceps tendon, as it curves around the humeral head, changing from a vertical course in the sulcus into a horizontal one in its intraarticular portion, up to its insertion at the upper glenoid labrum. Axial slices allow for inspection of both the infraspinatus and the subscapularis tendon. The latter is also torn frequently, whereas lesions of the infraspinatus are rarer. The position of the coracoid process in relation to the humeral head is easily assessed. This is important when there is a question of so called anterior impingement. Lastly the configuration of the anterior or posterior glenoid labrum can easily be interpreted in this plane. Finally the semisagittal images are interpreted. There we specifically look for the configuration of the rotator cuff, but also for the configuration and orientation of the acromion. Occasionally inclination or anterior hook formation of the acromion will indicate predisposition for superior impingement of the cuff. Obviously, tears of all cuff portions are also easily discerned in this plane, and so is the rotator interval.

### PATHOLOGY

As regards to pathology, the three most important entities affecting the shoulder will be addressed here: A) Impingement, B) Rotator cuff ruptures, and C) Instability.

#### Impingement

Compression of the rotator cuff can be primary, due e.g. to narrow space between the humeral head and the coraco-acromial arch (superior impingement) or between humeral head and coracoid process (anterior impingement). Secondary impingement is due to instability of the very mobile shoulder joint, leading to dynamic narrowing of the thoracic outlet. Neer distinguished 3 stages of impingement [25]: stage I with reversible oedema, stage II with fibrosis and tendinosis and stage III with tears of cuff. In primary impingement all structures forming the coraco-acromial arch can cause the impingement.

The MR pictures in impingement may be normal, or show thickening of the tendon affected, with increased signal replacing the normally low signal of a healthy tendon.

**TABLE 1.** MR pulse sequences and imaging planes used routinely for the examination of the shoulder joint

<table>
<thead>
<tr>
<th>Image plane</th>
<th>Sequence</th>
<th>TR/TE</th>
<th>FOV</th>
<th>Voxel</th>
<th>Sl.Thk/Gap</th>
<th>N Sl</th>
</tr>
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<tbody>
<tr>
<td>Axial</td>
<td>T1 SE</td>
<td>534/15</td>
<td>160</td>
<td>0.63x0.63x3</td>
<td>3 mm/0.3</td>
<td>20</td>
</tr>
<tr>
<td>Semicoronal</td>
<td>T1 SE (FatSat)</td>
<td>699/15</td>
<td>160</td>
<td>0.5x0.63x3</td>
<td>3 mm/0.3</td>
<td>20</td>
</tr>
<tr>
<td>Semicoronal</td>
<td>PD SE</td>
<td>1618/25</td>
<td>160</td>
<td>0.63x0.78x3</td>
<td>3 mm/0.3</td>
<td>20</td>
</tr>
<tr>
<td>Semicoronal</td>
<td>T2 SE (FatSat)</td>
<td>2000/60</td>
<td>200</td>
<td>0.66x1.07x3</td>
<td>3 mm/0.3</td>
<td>20</td>
</tr>
<tr>
<td>Semisagittal</td>
<td>T1 SE</td>
<td>536/15</td>
<td>170</td>
<td>0.51x0.72x4</td>
<td>4 mm/0.4</td>
<td>20</td>
</tr>
</tbody>
</table>

TR – repetition time in ms; TE – echo time in ms; FOV – field of view; Sl.Thk – slice thickness in mm; Gap – distance between slices in mm; N Sl – number of slices; T1 – T1 weighted images; SE – spine echo technique; PD – proton density images; FatSat – fat saturated images; T2 – T2 weighted images.

**FIGURE 6.** Impingement in association with curved Acromion (Type II).
A – Sagittal slices show thickening and increased signal due to tendinosis in ventral portion of supraspinatus tendon (●).
B – Dorsal portion shows normal thin combined supra / infraspinatus tendon («).
(Figure 6). Most frequently osteophytes arising from the acromion or thickening of coracoacromial ligament cause supraspinatus compression i.e. impingement. There are three different configurations of acromia [26, 27] and type II and III may predispose to superior impingement. Also, os acromiale (Figure 7) or hypertrophy of AC joint osteophytes can cause impingement. Subcoracoid impingement occurs after fractures of coracoid or lesser tubercle. As mentioned, secondary extrinsic impingement occurs in cases of instability [28]. These patients are frequently athletes and their repetitive overhand activities as throwing may lead to posterosuperior glenoid impingement [29] and degeneration, as well as tearing of the articular fibres at the junction between the infraspinatus and supraspinatus tendons. The damage occurs during abduction and external rotation and is often associated with posterosuperior glenoid labral tears.

Rotator cuff tears

On conventional arthrography tears are suspected in situations of fluid extravasation into the subacromial bursa. However, occasionally even large tears may not show up due to adhesions of the capsular structures. Supraspinatus tears, by their superior position above the humeral head, can usually be visualized directly on conventional arthrography, but small tears may go undetected, but can be nicely visualized on MR (Figure 8). On MRI tears of the rotator cuff are visualized in all major planes as fluid fills the gaps in the tendon, be they superior, anterior or posterior. Tears most frequently occur in areas of tendinosis near the humeral attachment on the major tubercle (The term tendinosis is generally preferred to tendonitis, as histologically degenerative changes and no inflammatory infiltration of the tendon are found) [30]. Tendinosis creates increased signal in short TE MRI sequences and may be easier diagnosed if tendon also thickened (Figure 6). Usually some degree of tendinosis is found in situation of tendon calcification. By its exposed location under the acromion, the supraspinatus tendon is most commonly involved in tendinosis. As regards to tears, full thickness tears are distinguished from partial tears, which can be very small (Figure 7) or moderate sized (8 B, C). These again can involve the bursal or the articular side, with articular sided tears more frequent [31]. Partial tears may also be located within the substance of the tendon, the so called “intrasubstance” tears. Partial or complete full-thickness tears may coexist in different portions of cuff. Rent tears are anterior and are usually small (Figure 9).
Full thickness tears are divided into small (≤1 cm), medium (1-3 cm), large (3-5 cm) or massive (≥5 cm) tears (Figure 10) [32, 33]. Massive tears, besides involving the supraspinatus tendon, usually also affect the infraspinatus tendon posteriorly and the rotator interval and subacromial tendon anteriorly. In such tears there will be retraction of the tendon stumps and muscular atrophy. Also cranial migration of the head is usually seen already in plain x-ray views, as the cuff above the head is missing (Figure 10).

**Figure 9.** Small rent tear.
A – Semicoronal view of small anterior “rent” tear at the insertion of the supraspinatus tendon (●) with some bone marrow oedema.
B – Axial slices indicate same small tear in anterior portion of supraspinatus tendon (●). Associated Hill-Sachs impression fracture of humeral head, explaining the marrow oedema in 9A.

**Figure 10.** Large tear of supraspinatus tendon.
A – Conventional image indicating extravasation of contrast media into subacromial bursa (●) in this 70 year old patient.
B – Semicoronal images in Arthro MRI. Due to retraction the supraspinatus tendon above the humeral head is missing (●). This leads to cranial movement of the head. There is also AC-degenerative change.
C – Semisagittal images: top image: a cut more lateral indicates missing anterior half of supraspinatus tendon (●). Bottom image: a cut more medially shows the retracted supraspinatus tendon, which at this level is normal.
Partial tears are graded into Grade I if less than one forth of the tendon or <3 mm, Grade II if less than one half (3-6 mm) and Grade III if more than one half of the tendon (>6 mm) is involved [31]. Not only the size of the tears, but also the degree of muscular atrophy (Figure 11) should be reported, as the chance for successful therapy i.e. re-anastomosis of torn tendons and ultimately good function are limited if there is significant atrophy and tendon retraction. Biceps pathology is frequently associated with chronic tears of the supraspinatus tendon. All stages from tendinosis to full ruptures of the intraarticular portion of the biceps tendon are observed. In subscapularis tendon ruptures, the biceps tendon may subluxate medially into the body of the subscapularis tendon or even completely luxate into the medial joint cavity (Figure 12) [34-36]. As the biceps tendon runs through the so called rotator interval, the term “intervallesion” has been coined and refers specifically to lesions of that anterior portion of the rotator cuff that includes the rotator interval, which itself is bare of tendons (Figures 3, 8B and C). More recently the value of some fine ligaments running through the capsule in the interval have been recognized as stabilizing structures of the biceps tendon, which in the highly mobile joint must be dynamically stabilized as it dives from the joint cavity into the sulcus. Lesions of the rotator interval therefore are frequently associated with tears of the coraco-humeral and superior glenohumeral ligaments, the so called rotator interval pulley of the biceps tendon [37].

The subscapularis tendon may also show tendinosis if there is the so called anterior or subcoracoid impingement [38-41]. Occult subperiosteal fractures, frequently affecting the major tuberculum associated with rotator cuff tears, are easily diagnosed in MRI due to the associated bone marrow oedema (Figure 13).

Instability

The shoulder joint, although featuring an extreme range of motion, exceeding the one of all other joints, under most circumstances is stable, due to the tendon reinforced joint capsule, several glenohumeral ligaments, various muscles, the glenoid labrum and least of all the osseous glenoid. An instable shoulder joint can be habitual or occur after an acute trauma of the mentioned structures as after a dislocation, which possibly may lead to chronic instability. Instability can be anterior, posterior or multidirectional [42]. All soft tissue structures can be involved and accordingly need to be checked with imaging, with MRI usually particularly helpful.

The relative limited coverage of glenoid fossa by humeral head poses a risk for instability by itself. If there is a particular shallow or dysplastic glenoid, as in glenoid hypoplasia or glenoid rim deficiency [43] or retroversion [44], this may further predispose to instability. Instability occurs furthermore, if the glenoid labrum

FIGURE 11. Large supraspinatus and subscapularis tears with secondary muscular atrophy.

A – Axial image through upper shoulder joint indicates a massive tear of the supraspinatus and subscapularis tendons. Only the posterior tendonfibres of the supraspinatus are intact and seen as black stripe (●).

B – Axial image a bit lower indicates a missing subscapularis tendon, with the stump of the retracted tendon being seen just in front of the anterior glenoid rim (●). Only the infraspinatus tendon posterior to the head is intact.

C – Sagittal image: subscapularis tendon missing completely and supraspinatus tendon missing partially: only the posterior supraspinatus tendon fibres are seen (●). The infraspinatus tendon is normal.

D – Sagittal image more medially cutting through the Rotator cuff muscles: The supraspinatus and subscapularis muscles are atrophic (●) due to long standing complete subscapularis tear and subtotal supraspinatus tears. The infraspinatus muscle has a normal volume, as the infraspinatus tendon is intact.
FIGURE 12. Complete Biceps tendon subluxation.
A – The axial image shows an empty bicipital groove and a small mass medial to the humeral head and anterior to the glenoid (●).
B – An anterior coronal slice indicates an obliquely running dark stripe (●) passing from below to the upper glenoid rim; this is the long head of the biceps tendon, completely luxated out of the sulcus and being positioned like that in the anteromedial joint cavity, instead of running over the humeral head.

FIGURE 13. Impression fracture of humeral head involving major tubercle (●) better appreciated on MRI than on x-ray.
A – X-ray depicting small osseous fragment after trauma, but otherwise does not indicate major pathology; B – Two axial slices in same patient: dark bone marrow oedema in fractured portion of humeral head (●) and a clear tear at the basis of the anterior glenoid labrum (●); C – 2 Coronal slices showing impression fracture as well as tear of supraspinatus tendon (●).
and glenohumeral ligaments, especially the inferior gleno-
humeral ligament, are injured [45-49].

As regards to imaging, in instability the plain x-rays

have a role to play: usually a 5 view routine with ap pro-
jections in internal (IR) and external rotation (ER), the
Y-projection and the axillary and abduction projections
are performed. With these x-rays the typical Hill-Sachs
and Bankart lesions can be demonstrated. As, however,
soft tissues are frequently also injured, there is nowa-
days a role for cross-sectional imaging and for this we
also use mostly MR, which is very accurate for diagnosis
and as a roadmap (guide) for the arthroscopist. Usually
patients do not reach us in the acute stage and therefore
optimally need contrast media application. Besides the
mentioned osseous fractures of the anterior glenoid rim
(Bankart lesion) after ant. dislocation, the typical Hill-
Sachs impression fracture [50] are easily observed in all,
but best in the axial plane. After dislocations, frequently
there is capsular stripping of the glenoid neck and tears
of the anterior inferior glenohumeral ligament and ante-
rior labrum. Posterior dislocations are rare and if present
they are frequently associated with multidirectional insta-
bility. Beyond the obvious rotator cuff and labral tears,
diagnosis of soft tissue pathology has become extremely
refined. A spectrum of lesions are differentiated and
described by at times incomprehensible abbreviations,
depending on the injured structure. This includes the so
called SLAP (Superior Labrum Anterior-Posterior) lesion
of the biceps anchor at the superior labrum (Figure 14),
the ALPSA-Lesion (Anterior Labroligamentous Periosteal
Sleave Avulsion), the GARD-Lesion (Glenoid Articular
Disruption), the HAGL-Lesion (Humeral Avulsion of
the Glenohumeral Ligament) and the GLAD-Lesion
(Glenolabral Articular Disruption Lesion) [51-53].

As regards to therapy TUBS (Trauma, Unidirectional,
including Bankart defects) lesions are clinically differ-
entiated from AMBRI (Atraumatic, Multidirectional,
Bilateral, Rehabilitation) lesions. The former are surgical
and the latter are usually treated by rehabilitation. In

instability, the Arthro MRI offers again the advantage of
a capsular distension with increased conspicuity of soft
tissues. [47, 54-58]. Also to be mentioned is the use of
MR Arthrography in the postoperative situation [59].
However, partial postoperative tears are less easily con-
firmed than full thickness tears by MR.

**RETROSPECTIVE REVIEW OF OWN CASE MATERIAL**

In a retrospective review, 100 consecutive patients (58
men, 42 women, average age 54.1 years) referred to our
institution for diagnostic workup for shoulder complaints
in the months of November and December 2006 were
analysed for the spectrum of diagnosed pathology. One or
more diagnostic observations were made in each patient.
All diagnoses are summarized in Table 2. The findings
can grossly be grouped in lesions of the rotator cuff (with
its three portions the supraspinatus, the subscapularis
and the infraspinatus tendons plus the rotator-interval),
lesions of the biceps tendon, lesions of the glenoid labrum
and degenerative changes of the gleno-humeral and acro-
mio-clavicular joint. Out of the 100 patients only 4 were
without visible pathology, whereas in the remainder usu-
ally degenerative or posttraumatic combined lesions were
diagnosed. Not unexpectedly soft tissue pathology was
abundant, being present in 22-55 % of the cases, whereas
occult fractures were seen in only 8%.

An analysis regarding further diagnostic workup, ther-
apy and final outcome was made in the patients. Out of
the 100 patients we were able to contact 71 by telephone:
39/71 (55%) apparently did not require any further diag-
nostic workup or surgical therapy, 11 (15%) were exam-
ined and treated arthroscopically and 21 (30%) needed
open surgery. Some 7 months after their MR studies, out
of the 71 patients 43 (61%) felt better or had no more
symptoms, whereas 22 (31%) were unchanged regarding
their symptoms and 6 (8%) felt worse.
In medicine elaborate diagnosis obviously makes sense if there are means for adequate therapy and there is a good chance for better outcomes. In the field of musculoskeletal disease, arthroscopy nowadays fulfils these criteria and in many cases it replaces more invasive surgical therapies. It is in collaboration with trained arthroscopists, where a high resolution Arthro MR and diagnosis of early and subtle pathology allows for an optimal preoperative roadmap and gives best surgical results. As far as diagnostic interpretation is concerned, the potential and the limits of Arthro MR have to be realised both by the radiologist and the referring surgeons. Detailed knowledge of the anatomical structures and their pathology is essential for rational work with Arthro MR, just as an immaculate technique both for conventional arthrography and the subsequent MR study. Judging from the large number of patients referred to our centre, we confirm what is generally known: soft tissue lesions after shoulder trauma are much more frequent than generally believed. And it is generally known: soft tissue lesions after shoulder trauma and is more limited in depicting subtle labral and tendon pathology and both sonography and CT are being surpassed by MRI.

We hope to shall raise interest of Serbian colleagues for the method of Arthro MRI and are confident that in future more patients will benefit from this small invasive imaging method to study the shoulder joint.

**CONCLUSION**

We present our experience with shoulder MRI in a small group of patients. This review is supplemented by a pictorial review of typical pathologies, which for space reasons obviously has to be limited. Shoulder MR is now considered the standard among the imaging methods for optimal depiction of pathology, at the same time giving the arthroscopist an excellent road map for his intervention. While Arthro CT and ultrasound certainly also have their merits as examination methods, they also have their limitations. Ultrasound needs a very experienced sonographer and CT needs reformating of the axial pictures and is more limited in depicting subtle labral and tendon pathology and both sonography and CT are being surpassed by MRI.

**REFERENCES**


ПАТОЛОГИЈА РАМЕНОГ ЗГЛОБА – БОЉЕ ДИЈАГНОСТИКОВАЊЕ ПОМОЋУ МАГНЕТНЕ РЕЗОНАНЦИЈЕ: СЛИКОВНИ ПРИКАЗ И ПРЕГЛЕД ЛИТЕРАТУРЕ

Andreas NIDECKER
IMAMED Radiologie Nordwest, Базел, Швајцарска

КРАТАК САДРЖАЈ
У раду је описано ауторово лично искуство с применом магнетне резонанције (MR) и контрастног средства (Arthro-MR) код прегледа раменог зглоба (Shoulder MR). Овај метод се упоређује са другим чешће примењиваним дијагностичким методима, који такође имају неке предnosti. Дијагностичка индикација за примену метода Shoulder Arthro-MR и Дају детаљан опис и објашњење технике. Такође се разматрају најважније патолошке промене рамена, као што су различити поремећаји зглоба, руптuru мишића и нестабилности зглоба. Излаже се целокупном преглед патолошких промена утврђених код 100 болесника, као и примењено лечење и исход лечења. Даје се сликовни приказ типичних патолошких промена утврђених применом магнетне резонанције. Поред рендгенолошког прегледа, Shoulder MR се данас сматра стандардном радиолошком техником у дијагностиковању поремећаја рамена будући да се њоме омогућује оптимални опис патолошких промена, као и постављање дијагнозе на основу снимака рамена из најважнијих улога. Истовремено, овај метод представља артроскопистички одличан пут као приликом само интервенције. Моно се закључити да je Shoulder MR, уз савремено хируршко и артроскопско лечење, знатно побољшао исход лечења код повреда рамена.

Кључне речи: анатомија раменог зглоба; дијагноза обољења раменог зглоба; метод Shoulder Arthro-MR; приказ обољења раменог зглоба; приказ повреде раменог зглоба

Andreas NIDECKER
IMAMED Radiologie Nordwest
Unt. Rebgasse 18, CH 4058 Basel
Switzerland
Tel.: +41 61 686 42 42
E-mail: andreas.nidecker@imamed.ch

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