

6 inspiring case studies which emphasize the importance of objective clinical reasoning in orthopaedic medicine

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**O**n a family reuniun you are approached by a 32-year-old relative, claiming he is having problems with his **left shoulder**. These last for about 3 years with intermediate free periods. When such an episode sets in, every shoulder movement is painful, furthermore, lying on the affected side is very uncomfortable.

Being asked about any previous trauma, he replies, the reason could have been an **old injury**, when he had been caught by a gigant wave on a beach on Tenerife and smashed against a metal fence, the left shoulder taking the most of the force by impact. Immediately afterwards, however, he doesn't remember having any problems. He adds, that he occasionally swims, does cycling and climbing. The pain is not present at rest and does not radiate. Other joints are not affected, he doesn't take any regular medication.

## Clinical skills in OM

Regarding the lokalisation of pain, his finger points to the top of the shoulder. Inspection does not reveal any pathologic findings. We perform our functional examination, consisting of 12 + 1 tests, and find out the following: absence of pain arc, pain more or less pronounced at the end of all passive movements. No movement restriction, slightly positive resisted adduction test. The *additional* passive horizontal adduction test turns out to be the most painful one



## Clinical reasoning

At this stage, it should be clear, which part of the shoulder five-joint complex is affected. It is a small, seemingly innocent and often overlooked *acromioclavicular joint* (hereinafter ACJ), that definitely deserves our attention.

ACJ is a, unlike other shoulder structures, *C4 structure*. As such, it causes more or less local pain at the tip of the shoulder. The patient will, being asked to pinpoint the pain with the finger, usually do so without any difficulty.



If other shoulder structures are affected, the patient's localization of pain is largely unclear and diffuse in the *deltoid region*. Such a patient – stereotypically – instead of the finger, uses the entire palm, that is placed on the side of the shoulder.

#### Fall on the shoulder

In the joints, the mobility is always in conflict with stability. The capsule of ACJ is enhanced by AC-ligaments that provide horizontal, whereas extracapsular CC-ligaments guarantee vertical stability. Trauma to the shoulder can inflict damage to the stabilising joint-ligaments.

## Relatively mobile small joint

Functionally speaking, ACJ, via the collarbone, serving as a pillar (which stands on the rib cage), allows the movements of the scapula and thus the greater *flexibility* of the upper limb. To demonstrate its mobility, one can palpate the joint and perform various movements of the shoulder. Longitudinal traction on arm and external rotation of the shoulder provide the most significant movement of the joint cleft.

Clavicle drifts up the scapula

It is worth mentioning that the anatomical composition, whereby the end of the collarbone lies somewhat higher (important for palpation) than the corresponding part of the shoulder blade, allows the *sprain* of the AC-ligaments. By the action of external force, the shoulder blade moves medially and downwards, causing a *cranial shift* of the collarbone and damage to the AC ligaments.

Injuries are most commonly direct in terms of the force acting to the front of the shoulder (athletes) or less often indirect, such as a fall on the elbow or a stretched wrist. In the absence of greater instability, ACS responds extremely well to the therapy, applied in orthopedic medicine ....

# Does palpation really matter in a knee assessment?

Occasionally, we are faced with a situation, where precise history, as well as complete clinical investigation, do not lead us closer to the diagnosis. Is it possible, that the key lies in palpation ?

A 62-year-old lady complains about *pain in the left knee*. Pain is constantly present for more than a year. The patient does not remember the causative injury, she says that the problems have arisen spontaneously and gradually. Previously, she and her partner have taken daily walks, which is now possible only occasionally, in a shortened range and only on a flat terrain. Furthermore, she explains that it is *worst going downstairs* and that luckily she lives on the first floor of the residential block and not higher up.

She had been to an orthopaedic surgeon, who said that her knee was not jet mature for a *prosthetic knee replacement*. Painkillers and antirheumatic ointments did not bring about a significant improvement.

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History should provide us with diagnosis :

Thorough patient history is crucial for the assessment of knee joint. We have already learned some important data, such as atraumatic nature of problems. Moreover, the history of internal derangement (locking, twinges, giving way) is negative, although in Orthopaedic medicine, the *walking-down-the-stairs*-complains have in this regard a special meaning.

The lokalisation of pain is of extraordinary importance. Our patient replies that the pain is more or less *limited to the inner part* of the knee and that occasionally her knee seems to be swollen. In the absence of diffuse pain and swelling of the entire knee, we can carefully 'exclude' the capsular impairment and concentrate more on the local pathology.

## Differential diagnosis of medial compartment pain

*The medial knee compartment* does not hold an abundance of structures that could cause our patient's problems. We are considering the medial coronary ligaments, perhaps the medial collateral ligament. Medial meniscus, however, is less likely. Unfortunately, we now have to approach a clinical examination without a clear working hypothesis...

After a clinical examination, comprising of a *battery of 12 tests*, we get exactly what we are most afraid of- the whole investigation is negative. By using both passive and resisted tests- we were unable to reproduce patent's pain. Even the additional test of resisted knee flexion with knee in internal rotation in sitting turns out to be negative. What now?



Getting closer to the diagnosis

Perhaps the answer lies in *palpation*. The structures of the medial compartment are now to be palpated to determine the potential sensitivity to palpation. Concerning interpretation, one has to be very cautious and above all, we always compare positive results with a healthy side.

We find a prominent local sensitivity over the pes anserinus area. Moreover, under our fingers we discerne a *clear swelling* that is not present on the healthy knee. Is the diagnosis now clear?

Pain syndrom on walking downstairs...

Pathology is less common, that are for instance pre- or infra-patellar bursitis, but not negligible. It is more common in the elderly, especially in the presence of genu valgum or medial knee instability. It manifests itself by pain on squatting or when *walking downstairs*.

Pain in pes anserinus bursitis should be clinically reproducible by *resisted knee flexion*, having the knee internally rotated (testing pes anserine- complex). There should come to an increase in pain in the event of abrupt discontinuation of the resistance during this test. Moreover, the pain could be provoked by passive external knee rotation.



Back to our patient

Unfortunately, neither of these test was positive in our patient. We did, however, using clues from history and our palpatory skills, reach the diagnosis and applied the *targeted therapy*.

One week after the bursa-infiltration, our patient reports that she is overjoyed to be **pain free** and is now again able to walk freely with her husband, even on a hill near her home...

The knee is the only joint in Orthopaedic medicine in which palpations are incorporated into the basic functional examination. Occasionally, it may turn out that something as simple as good clinical tactile sense is the key to accurate diagnosis and successful therapy.

A 27-year-old female patient comes to an emergency clinic, explaining that since she woke up in the morning, she *no longer feels* the outer part of her right forearm and *can not move* her right hand.



No recent trauma sustained, she adds that due to a *drug substitution* program for treating addiction she takes benzodiazepines, antidepressants and muscle relaxants.

Neurological examination reveals complete muscular weakness of *wrist and finger extensors* and impairment of brachioradialis. The phenomenon is accompanied by the sensory deficit of the dorsum of the palm that extends posteriorly to the elbow.

## Saturday night palsy ?

The described clinical picture corresponds to *radial neuropathy*, better known as "Saturday night palsy". The nerve is especially vulnerable to prolonged compression in its course in the posterior *spiral groove* of the *humerus*. In patients with reduced psycho-physical state due to various external factors (alcohol, drugs, psychopharmaceuticals), the circumstances for the development of this syndrome are given.

The common cause is having slept in a position where the upper arm is pressed against the *edge of the bed*. Absence of pain reflexes or reduced pain threshold facilitates injury to the nerve, considering the fact that such compression can last for many hours.

Disc protrusion?

In addition to the functional examination of the wrists and fingers, an *examination of the elbow* is of vital importance for our clinical reasoning. We find that the muscular strength of the triceps is also affected.

The pattern of the functional loss of wrist and elbow extensors speaks in favor of the radial nerve lesion, while protrusion would show a *different clinical pattern*. at the C7 level, the impairment of triceps and wrist flexors is to be expected, whereas at the height of C6, the structures affected are elbow flexors and wrist extensors.

C6	C7	N.radialis
Elbow flexion	Elbow extension	Elbow extension
Wrist extension	Wrist flexion	Wrist extension

Table: A pattern of motor dysfunction

The Importance of patient's history

Cyriax accurately defined clinical syndromes provoked by pressure on the different components of the nervous system. The leading symptom of compression of the nerve trunk or of the nerve plexus are "**pins and needles**" or **paresthesia**. Better yet, he describes a *release phenomenon*, whose typical example is the pressure on sciatic nerve.

Release phenomenon and free interval

We are all familiar with the electrifying feeling, triggered at the first steps **after** sitting in the position in which sciatic nerve was being compressed. Interestingly, the interval between the end of the compression and the onset of symptoms depends on the *duration of the pressure* on the nerve. Long-lasting compression produces a *'free interval*, best depicted on the case of a compression neuropathy of the brachial plexus.



Pins and needles in both upper limbs

The cause of the thoracic outlet syndrome is in its benign form the *looseness of the soft tissues* of the shoulder girdle. Normally affected are women of somewhat stronger body constitution. During the day, pressure on the lower part of the plexus occurs, late at night or early in the morning, after the free interval having passed, the typical *bilateral* sensation of *pins and needles* in the upper limbs occurs.

Symmetrical paresthesias typically occur **at night** when the pressure on nerve plexus ist relieved (hence the term release phenomenon). After excluding any space occupying lesion of the cervical spine by visual imaging, the patient is advised to use **pressure relieving exercises**. This can easily be achieved, for instance by supporting elbows while sitting in a chair before going to bed, frequently shrugging the shoulders in the course of the day, as well as by exercises to increase muscle tone of shoulder girdle musculature.

At first, *earlier onset* of pins and needles (shortening of the free interval) is to be expected. Eventually, the duration of the unpleasant sensations shortens and finally, the nerve plexus recovers and the symptoms disappear.

## Paresthesia on compression

Pressure on the nerve plexus or the nerve trunk is characterized by pins and needles that occur only *after* the end of the pressure. The exception to the rule is the distal region of the upper limbs or at/distally from the elbow. The best illustration of this is, for example, the pressure on the trunk of the *ulnar nerve* in its elbow groove, where pins and needles are provoked while the pressure is being exerted. In this case, we are faced with the *compression phenomenon*.



Therapy of Saturday night palsy

Our patient suffered *axonal damage* to the radial nerve trunk in the *-loco typico* (posterior groove of humerus) area. Clinical syndrome was confirmed electrophysiologically in the department of neurology.

Since the nerve damage is reversible, only supportive measures are provided in terms of a *splint* that prevents the lengthening of dorsal tendons and additional damage to the soft tissues, *mobilisation* exercises and *electrotherapy* to maintain muscle strength and to stimulate the nociceptive input.

In an early stage, when the patient is desperate, exercises with a *palm in the horizontal*, resting on the napkin, can be tried. This way, in terms of feedback, the patient can detects even so tiny movement and gets motivated for the future. In addition, B-vitamin supplements can contribute to a faster recovery. Electrophysiological measurements should be conducted at regular intervals.

Prognosis and our patient

Within a week, our patient does not notice any improvement. She describes that, shortly after the initial event, she developed *local pain* at the site of pressure. Anti-inflammatory therapy has been introduced.

The prognosis of the described compression neuropathy is generally *excellent*. According to literature, a complete clinical resolution is expected within 1 to 6 months, most of the patients having recovered from muscle paresis and being symptom free after *three* months.

To conclude –

In a general opinion, pressure on the nerve trunk triggers the appearance of pins and needles. In our clinical case, this could -theoreticaly- have awaken the patient or at least made her to move her arm, preventing the damage to the nerve. However – sadly this is not the case. Considering the localization of the pressure, the *release phenomenon* is to be expected, with symptoms emerging only *after* the end of the compression periode plus free interval.

Thus, we can sum up that a person without the influence of psychoactive substances is able, due to protective pain reflexes, to move his/her arm from a position that could potentially damage the nerve. Nonetheless, if you do find yourself in such a state, make sure you have a well-padded sleeping area...

# Slipping rib- or Cyriax syndrome

**P**ain in the upper abdomen is usually not a domain of orthopedic medicine. However, when the cause of pain after a number of investigations remains unclear, it's time to start thinking about something more exotic, such as – 'slipping rib' or 'Cyriax syndrome'.

**P**ain in the upper abdomen is usually not a domain of orthopedic medicine. – Beforehand we need to consider internistical and surgical causes. However, when the cause of pain after a number of investigations remains unclear, it's time to start thinking about the affection of the muskuloskeletal system, either the spine or perhaps even something more exotic, such as – **hypermobile** lower ribs, known as 'slipping rib' or 'Cyriax syndrome'.



#### Masked pain

It is well known that abdominal pain is often an expression of the pathology of the spine. Disorders of the intervertebral disc at the level of the thoracic spine as well as subluxation of the posterior rib joints are both prone to developing *referred pain* to the area of the abdomen.

As a result, the patient will be diagnosed with different disorders, such as kidney stones, inflammation of the appendix or gallbladder, pancreatitis or peptic ulcer. Furthermore, in the case of breathing difficulties, a heart attack will be considered, pulmonary embolism, pneumothorax, pneumonia or similar...

When all laboratory, imaging and endoscopic diagnostics fail to find the cause of the patient's problems, *orthopedic medicine* may be able to bring the patient closer to successful therapy.

## Cyriax syndrome ?

In the literature, one finds clinical cases of patients with intermittent pain in the lower part of the thorax or upper abdomen resulting from the hypermobile lower ribs, the so called *'slipping rib syndrome'*.

The first 7 ribs are firmly anchored in the thoracic cage through the costosternal joints and the associated ligamentary reinforcements. Ribs 8-10, on the other hand, do not have a direct connection with the sternum. Hense the label *'false ribs'*, since they are only loosely attached to the cartilage of the upper rib.



Rib impingement

The hypermobility of false ribs is most likely the result of a minor or greater *trauma*. The latter damages the stability apparatus and leads to repeated subluxations and consequently an irritation of the *intercostal nerve* and surrounding structures.

In some cases, mild subluxation is triggered by a deeper breath, forward bend, or other body movement. Furthermore, patients occasionally describe the clicking sensation. Theoretically, the false rib could even be released of its fixation and thus becomes a *free or floating rib*. The most commonly involved is the 10th rib.

Clinical syndrome is characterised by recurrent, more or less unilateraly pronounced *sharp pain* in the subcostal or epigastric region. The fact that the pain can be provoked by certan movements, activities or postures, should help in assumption, that we are dealing with the musculoskeletal system.

Simple provocation test

The clinical entity was first described by Dr.Cyriax as far back as 1919. With the purpose of reaching the diagnosis, he suggested a simple clinical test called *'hooking maneuver'*.



#### Image: Hooking maneuver

It is an extremely simple test, where one uses his/her fingers to grab the subcostal margin of the thorax and tries to displace it both cranial and outward.

During the test, the patient is lying on the back with relaxed abdominal musculature. Provocation of pain and possibly a click signifies a positive test.

#### Therapy – injection or knife

Confirmation of the clinical diagnosis is achieved by *intercostal nerveinfiltration*, being at the same time also a therapeutic approach. A dynamic representation of subluxation can also be accomplished using ultrasound.

More persistent or unstable cases call for surgical treatment with resection of the affected rib.

Presented clinical syndrome is a rarity, but for a desperate patient, suffering for months or years, it certanly isn't just a minor problem. If one would think of this syndrome in the course of diagnostic tests, not only the patient would sooner be pain free, but he also wouldn't have to undertake all the unnecessary and sometimes tedious diagnostic procedures.

# Is it truly the back?

**S**ometimes it turns out that our diagnosis at first sight may after all not be the correct diagnosis. Numerous discrepancies namely do not fit to the expected clinical picture. How can a **good history** help us in the case of a lower back pain?



A 42-year-old lady complains of *lower back pain* with pain radiating over the right hip. The problems appeared spontaneously, without any known trauma. She doesn't take any regular medication. With the exception of occasional migraine headaches, she doesn't have any other medical problems. X-Ray of her lumbar spine and SI-joints show signs of wear. Her GP puts her on a sick leave, introduces NSAR-therapy and issues a work order for *physiotherapy*...

After one week physiotherapy, her complains are not getting better, instead the pain even *intensifies*. At the moment, the pain is most pronounced on the right side, especially when walking, the worst being the stairs. Because of the pain, sleeping on the affected side is impossible. The patient is desperate – she claims, due to physiotherapy everything has just gotten worse and that she doesn't want to continue it anymore. Now, because of pain, she can not walk, work, or sleep.

## Clinical reasoning- Method by J.Cyriax

Using the knowledge and skills of OM Cyriax, we know that, for assessing the lumbar spine, the patient's *history* is crucial. Now, let's try to put data from the history into a meaningful working hypothesis. –

The first step would be to classify the clinical picture of our patient to the appropriate *clinical syndrome*. Our patient's history most closely corresponds to the image of *backache*. The term has no chronological meaning, but rather indicates the intensity of disco-dural interaction.

The next step is to obtain four significant informations: the size (1), the consistency (2), and the lokalisation (3) of the disc protrusion as well as assessing the risk of developing cauda equina syndrome (4). Reducibility of the protrusion, as the fifth element, may be more a domain of clinical examination.

Taking into account our patient's history, we are considering a *small nuclear posterocentral protrusion*, most likely at the lower lumbar level with dural reference. In view of absent symptoms suggesting cauda equina syndrome, we can speak of a non-dangerous protrusion.

### Troubled by doubts

After a careful consideration, unfortunately, the second part of the history provides us with some fundamental doubts. The *pain shift* coincides with our working hypothesis, as it is an internal disorder in which the rule *'a shifting pain is a shifting lesion'* applies.

We could be dealing with a simple shift, but if we are considering the development of root pain or *secondary posterolateral protrusion*(SPLP), the phenomenon isn't alarming. We even talk of a normal evolution.

The fundamentals of referred pain in OM teach that pain can be found in any part of the dermatome. It must be recognized, however, that root pain, limited exclusively to the right hip, is rather unusual.

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Walking pain

The next inconsistent information is walking difficulties. Exacerbation of pain is to be expected when seated or, in the case of hyperacute lumbago, pain twinges accompanying more or less every movement.

The clinical picture of *acute lumbago* can be recognized at first glance. By entering the clinic, a patient is taking slow careful steps with a straightened or deviated back. As a result of a large protrusion with an intense dural interaction, each of the smallest movements in the spine triggers painful twinges. Such a patient typically moves 'in one axis' and gratefully declines a friendly invitation to sit down. Again, patients with lower back pain better tolerate the *standing* position.

## What about walking the stairs?

Further concern about walking the stairs could indicate L3 root pain, where patients prefer the position in flexion, some even prefer to sleep in the armchair. In this case, walking down the stairs would be very unpleasant, ascending the stairs, on the other hand, notably less problematic. Similarly, in OM we are familiar with *spondylolisthesis*, where clinically the pain is present in an upright posture while walking or standing. Sitting and lying makes the pain fade away. Our patient, however, does not indicate the difference between walking up and down the stairs.

### More doubt in our working hypothesis

Difficulties in walking the stairs and difficulty sleeping on the affected side are therefore further *inherent* unlikelihoods, that is, data from obtained patient's history, that do not correspond to the expected clinical picture.

#### What now?

Considering *pain at night*, it is a phenomenon that can speak either in favor of the marked inflammatory activity of the affected structure or perhaps of a local compression. Last but not least, the cough is negative in our patient, which, for a cyriax therapist, is an important dural symptom.

In any case, the fact that the patient's complaints are movement and position dependent, indicates a *positive PMA-history* (posture, movements, activities). This leads us to the conclusion, that we are, after all, dealing with a musculoskeletal pathology.

#### Puzzling clinical case

Armed with basic information, – unfortunately – with *reasonable doubt* in our working hypothesis, we now approach the functional examination ...

Do we have a *differential diagnosis* in mind?

To be continued...send us your suggestions to info@cyriax.eu

## 'True' joint without capsular pattern

*AC*-joint *arthritis* occurs quite often. The clinical distinction between the latter and the acromioclavicular ligament sprain is, due to different therapies, of crucial importance. How do we distinguish them?

Arthritis without capsular pattern

AC-joint (hereinafter ACJ) is a *'true'* synovial joint, that possess its *own capsule* and not uncommonly even an intraarticular disc. It is prone to development of arthrosis, which takes its toll significantly earlier (from the age of 20 years onwards) than other joints. In imaging studies, one often finds signs of tear, however, ordinarily without any clinical relevance.

In Orthopaedic medicine, we know that the impairment of the joint capsule produces well defined *capsular pattern*. In ACJ, however, this does not occur. The reason lies in the absence of muscular control, whose spasm would in case or arthritis reveal movement restriction in typical dimensions, otherwise known as capsular pattern.



Sprain or arthritis?

As a result, due to the absence of a capsular pattern, we cannot clearly distinguish between capsular involvement (arthritis or arthrosis) and, on the other hand, lesion of inert structures (in our case ligament sprain). Positive trauma history and the fact that young people more likely experience a ligament injury, while the older ones, as a result of overload, more often develop *traumatic arthritis*, are therefore helpful clues.

The clinical significance is the following: dealing with a sprain, either deep transverse friction (hereinafter DTF) or infiltration of the ligament is the therapy modality of choice. In the case of arthritis, we apply i.a. injection.

Clinical reasoning

Our patient (*see first case study*) has a positive history of shoulder injury and a clear clinical picture of the sprain of *superficial*acromioclavicular ligaments. As a result of transmitted stress, there may also be a positive resisted ab- or adduction test.

Due to the absence of painful arc as a localization sign, we can exclude the involvement of a *deep* acromioclavicular ligament. Moreover, at the end of functional examination, ACJ can be palpated for local tenderness and the result compared with a contralateral, healthy side.

### Clinical confirmation

As a confirmation of our working hypothesis, a physiotherapist may, for instance, apply a *few minutes of DTF* and then retest positive movements. A physician, on the other hand, could use diagnostic infiltration.



Friction brings more permanent improvement

After reaching a clear diagnosis of the sprain of *superficial* acromioclavicular ligaments, our patient receives an infiltration (*see Post At the tip of the shoulder*). After about three months, the problems reappear, resulting in another infiltration.

After 8 months he faces another relaps. It is now time for a different therapy approach: trial of two weeks of DTF.

After ending the therapy sessions, the patient – and at the same time the author of this post – has been *painfree* for more than 2 years now.

Conclusion

It should be emphasized that DTF, in the case of a ligament sprain, even though by nature is a more prolonged and more physically demanding therapy, often turns out to be much more grateful modality. True, that the infiltration leads to a rapid improvement, but unfortunately, often there are *recurrences*.

In our clinical case, we discussed the features of the ACJ. In accordance with the basics in Orthopedic medicine, we performed clinical examination and precisely defined the localization of the lesion. Moreover, by performing a complete functional investigation, we simultaneously excluded the involvement of other shoulder structures. The application of targeted therapy, using infiltration, led to an improvement, nevertheless with the occurrence of relapses. At the end, DTF was shown to be the therapy of choice.

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Any questions - more information?

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