

Shoulder



Introduction

The standardised operative treatment of the shoulder is a relatively new field of surgery. Shoulder pain was previously considered to be a rheumatic complaint and was therefore treated accordingly. However, in recent years it has been shown that because patients today are more involved in sports and are more active at all ages, more aggressive treatment is required to achieve freedom from pain and a fully functional shoulder.

Shoulder problems have so far been divided into two main groups. One group concerns shoulder problems caused by accidents in young patients, and the other group concerns shoulder pain in older persons, which can arise without an accident. As a result of improved understanding of the interactions between shoulder movements and the effects of individual anatomical features, a true sub-speciality of surgery has developed.

In the following pages you will see some examples of typical shoulder conditions and their treatment.

With this brochure we would like to answer some of your general questions on shoulder surgery. However, the specific problem of your shoulder must be determined by examining the findings with you.

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Anatomy

The bony framework of the shoulder is the shoulder girdle (Fig. 1), composed of the collarbone (clavicle (C)), shoulder-blade (scapula (S)) and upper arm bone (humerus (H)). This unit sits on the rib-cage (thorax), held together by joints and ligaments. Most shoulder-specific problems develop in the joint between the shoulder-blade and the upper arm (glenohumeral joint) and in the joint between the collar-bone and the shoulder-blade (AC joint). There may also be problems between the shoulder-blade and the thorax or between the collar-bone and the breast-bone. However, these problems are rare. The closeness of the shoulder to the spinal column in the neck (cervical spine) explains the frequent symptoms radiating from the sides of the cervical spine.

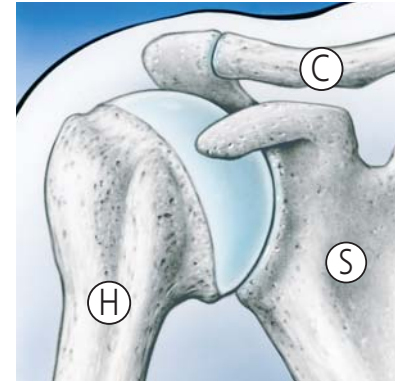


Fig 1

AC joint

In the AC joint area, the collar-bone and shoulder-blade are joined together by a dense capsular structure (Fig. 2). Inside this joint there is a flat fibrous-cartilaginous pad (disk). The AC joint has a relatively restricted range of movement. The main problem in this area is arthritis (Fig. 3). Prolonged overstrain leads to wear of the cartilage (a) and the disk (b). The joint swells and the edge of the bone becomes jagged. This can lead to constriction (impingement) under the top end of the shoulder-blade (acromion) and to injury of the rotator cuff. Symptoms may also arise after so-called dislocation of the joint (AC luxation) (Fig. 4).

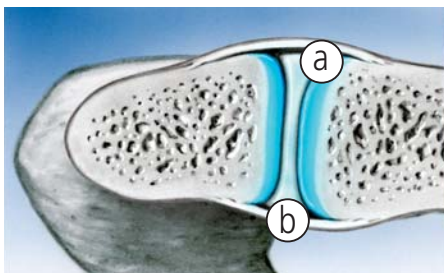


Fig 2

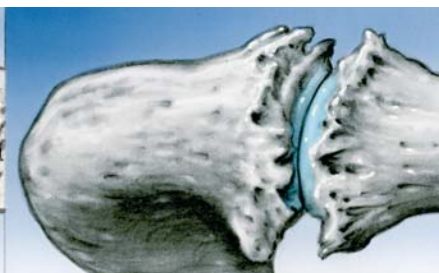


Fig 3



Fig 4

Glenohumeral joint

This is what most patients think of as the shoulder joint. To achieve the extremely wide range of movement that is desired, there is a multilayered connection between the relatively large ball head of the joint and the relatively small joint socket. This arrangement allows broad movement on the one hand while maintaining the necessary stability on the other.

The lowermost layer (Fig. 5) forms a cartilaginous ring (labrum glenoidale) around the joint socket, extending its diameter. The anterior stabilising ligaments (glenohumeral ligaments) and the long biceps tendon radiate from this ring. The long biceps tendon passes from this edge through a canal between the large and small tubercula of the humerus to the biceps. The next layer is the rotator cuff (Fig. 6). This is composed of small muscles (Musc. subscapularis, supraspinatus, infraspinatus and teres minor) between the head of the humerus and the shoulder-blade. These small muscles centre the head of the humerus during upper arm movements. Because the large superficial muscles would otherwise draw the head of the humerus out of the joint socket, these small muscles have to work against them and prevent the head of the humerus from slipping upward towards the acromion, forward or backward. These muscles and the long biceps tendon surround the head of the humerus like the five fingers of a hand around a ball (Fig. 7). The outermost layer is formed by the large, superficial muscles acting on the upper arm in each case. The main work is performed the deltoid muscle, supported by the large pectoral muscle or the large latissimus dorsi muscle.

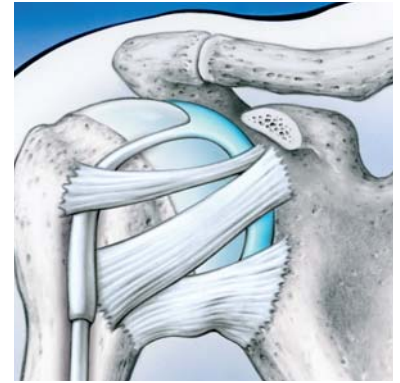


Fig 5



Fig 6

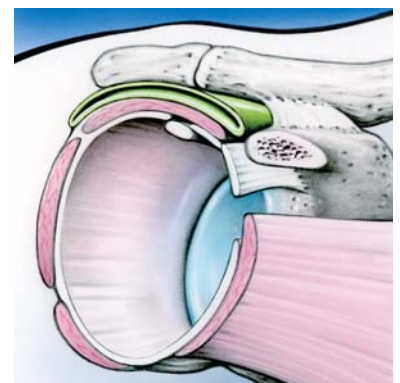


Fig 7

Operating techniques / Preoperative clarifications

With regard to the operating technique, in wide fields arthroscopy has gained acceptance nowadays alongside the conventional open procedures. In the case of arthroscopy a camera and also tools are inserted into the shoulder through small cuts (app. 5 -10mm). The large open approaches are thus no longer necessary. The minimally invasive arthroscopic technique is almost always applied, in the case of stabilisation operations in the joint, for relieving operations between the rotator cuff and the shoulder roof as well as for reconstruction of the rotator cuff.

Whether an arthroscopic or open technique is to be applied, should be discussed and decided with the patient on the basis of the findings made. Regardless of the technique, in general shoulder operations are carried out in a combination procedure consisting of general anaesthesia and regional anaesthesia. As the operation is very close to the head, the patient is here put into a light, shallow sleep and profits in addition from the efficient treatment of pain.*

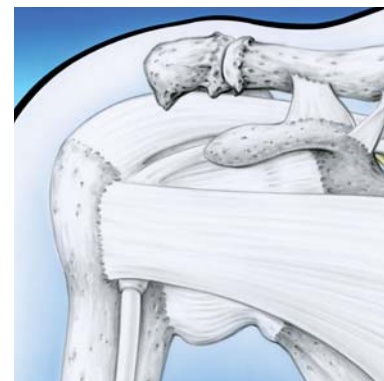
** In the case of regional anaesthesia, a thin catheter is inserted in the vicinity of the shoulder nerves through a needle. A local anaesthetic is injected through this catheter. The patient is thus almost free from pain even after the anaesthetic.*



Most shoulder operations are planned procedures, that means that all the risks should have been excluded as far as possible. In order to make this possible, it is important for the anaesthetist and the operator to know whether the patient, that is to say you have **other disorders which influence the anaesthesia and the operation**. You will, of course, be examined again thoroughly before the operation in the hospital. However, it has turned out that an examination by your family doctor often brings many additional bits of information. **It is thus to be recommended that you have these examinations carried out by your family doctor before an operation**. If such an examination is not carried out, I would ask you to think over whether you possibly know medical details which could interest us (**e.g. severe allergies, medicines which you have to take, diabetes mellitus, heart diseases, etc.**). In this case, I would ask you to inform either me, the anaesthetist or your family doctor.

Impingement

One of the most frequent symptoms in the case of shoulder complaints is the constriction of the head of the humerus under the roof of the shoulder when lifting your arm above the horizontal. This constriction is known as impingement. We distinguish between a primary and a secondary impingement. The former occurs through a narrowing of the space under the roof of the shoulder (for example in the case of a swelling of the synovial bursa, through the formation of spondylotic osteophytes in the case of arthrosis of the AC joint or in the case of calcification in the tendons of the rotator cuff).



These forms of impingement can be treated by an arthroscopic subacromial decompression, whereby the term „endoscopic“ would be more appropriate, as in this procedure the camera and the tools are not inserted into a joint, but into a synovial bursa. Then in the view of the camera either the synovial bursa can be removed, a calcium deposit scraped out, the roof of the shoulder smoothed (Acromioplasty) or an arthroscopically changed AC joint resected. This operation is always combined with an arthroscopy of the shoulder joint in order thus to determine and eliminate any possible causes for a secondary impingement.

A secondary impingement is a constriction of the head of the humerus under the roof of the shoulder, however, not on account of too cramped space conditions, but because when the arm is lifted the head of the humerus no longer remains in the joint cavity, but slides upwards. This inadequate centring occurs either in case of injuries to the rotator cuff, in case of weaknesses in the ligaments or in case of ruptures of the labrum. In such a case it is obvious that just a widening of the area under the roof of the shoulder would not bring any cure. The causes must be treated here. If the arthroscopy shows that the joint is intact, the camera is inserted into the synovial bursa under the roof of the shoulder and the widening is carried out. This normally lasts app. 30 minutes.

After the operation, a sling is put on the patient. The sling is then worn for between 5 and 10 days. In the postoperative treatment, careful movement is allowed directly up to the pain threshold, full mobility is, however, only possible after a few days. But in a normal case the follow-up treatment is of short duration and full working and sporting ability is reached within a few weeks.

Dislocation of the shoulder

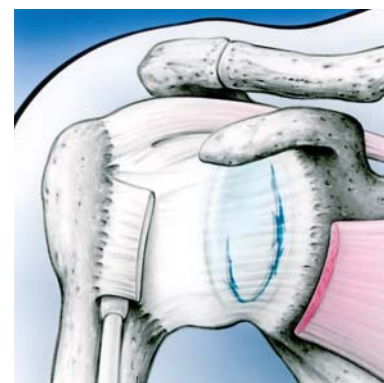
Causes and classification

Dislocation of the shoulder is a problem known from the earliest days of medical treatment. Until recently, however, a dislocated shoulder was considered to be a complaint typically requiring conservative (non-surgical) treatment. Only in recent years, due to greater understanding of the problem, a treatment strategy has been developed, adapted in accordance with the patient's basic condition. Only by analysing the underlying various pathological states has it been possible to determine why some shoulders could be reset without any problem, and showed stable results but others continued to dislocate repeatedly. It is now accepted that two groups of patients with luxations can be roughly differentiated: patients with luxation without exposure to greater force and patients with luxation after exposure to greater force.

In the case of the former there is a general ligament laxity (soft ligaments) that is very often also manifested in other joints, too, such as hyperextensible elbows and knees. The accidents leading to dislocation are often trivial. These luxations continue to be treated by conservative means. The instabilities have to be compensated by improved muscle function. Only in rare cases with highly disturbing instabilities do operative measures need to be planned. One possibility in this field is arthroscopic capsule smoothing. If the treatment fails, other procedures may also be needed in some cases (e.g. a Latarjet operation). The second group are patients with an otherwise very stable joint status. In this case the shoulder dislocates only after a very forceful event (such as a skiing accident, for example). As a rule, injury is caused to a bone or soft tissue in this case, as a result of which instable conditions occur between the socket and the head of the humerus. If such a stabilising structure is torn by the dislocation, the opinion today is that it should be reconstructed. The treatment of these patients has thus changed fundamentally.

In the case of luxations (dislocations), the head of the humerus is usually pushed down and forward. The anterior stabilising capsule with ligaments is torn. The cartilage ring (labrum) surrounding the bony joint socket is usually torn out, too, with the entire ligament structure. In rare cases, the ligament complex also tears on the side of the head of the humerus. At all events, this leads to a change in tension in the anterior capsule region, resulting in chronic instability in most patients.

Studies have shown that the risk of repeat dislocation is massively increased after this type of traumatic dislocation, especially in young, active people. For this reason, we recommend magnetic resonance imaging (MRI*) examination. With this imaging procedure, it is possible to show and appraise the capsular ligament apparatus. If such an injury pattern is shown, surgical restoration can be considered. Naturally, there are also luxations in the downward and backward direction. But they are special cases that often require special treatment.

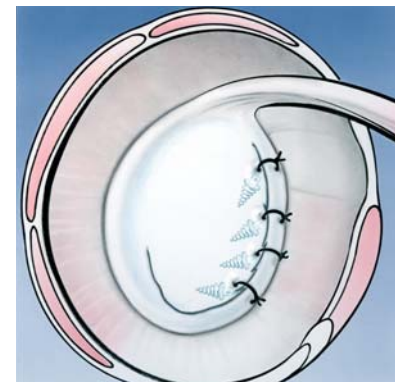
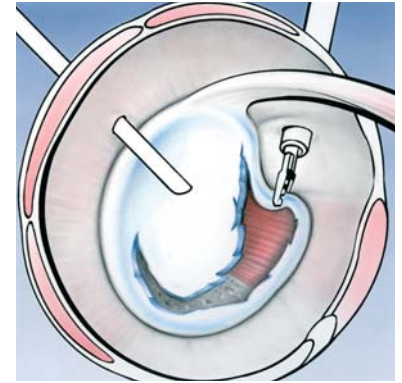


Arthroscopic shoulder stabilisation according to Bankart

Dislocations caused by an accident, as just described, with MRI*-confirmed detachment of the capsular ligament complex, are nowadays treated by means of arthroscopy. In this operation, a camera is introduced into the joint from behind. After repeated flushing, the defect must be prepared. If it involves detachment of the labrum, an attempt is made to return it back to its original position. For this, the capsule that has mostly grown back into an incorrect position is remobilised beforehand. An operation at the time of luxation often leads to poor healing due to the copious bleeding and the damage to the surrounding tissue. Because of this, we normally wait 3 – 4 weeks with the operation. After mobilisation, the bone is smoothed in the area where the labrum is to be sutured back in place. This means that superficial milling of the bone is taken down to a layer that is well perfused. Boreholes are then drilled. The labrum is pierced through and held by threads introduced through the anterior access. An anchor is set on each thread and each anchor is tapped into the appropriate borehole. In this way, using knotted sutures, the dislocated labrum can be fixed to the anchors from outside. Between two and six anchors are needed with this operation. In most cases, they are small absorbable wedges that will be completely absorbed.

This type of operation takes about one hour. We normally advise patients to remain in hospital overnight. Because the access is small, this surgical method is relatively painless. Immobilisation of the joint is required for three weeks after the arthroscopic procedure. Only after the three weeks can the arm be cautiously moved again. The full range of movement is normally possible after 6 – 8 weeks. Sports activities should be achievable after 12 weeks. However, this period of time can vary greatly depending on the nature of the defect and the patient. In the case of a comparison with the traditional open method of operation, the following can be stated for the arthroscopic procedure: In trained hands, the results are, it is true, a few percentage points poorer than with the open method, however the full shoulder function is restored more quickly with the arthroscopic treatment method.

** Magnetic resonance examination: With this method of examination, the patient is put into a tunnel-shaped electromagnet. In contrast to computer tomography, no x-ray exposure occurs for the body.*



Latarjet-Lafosse's procedure

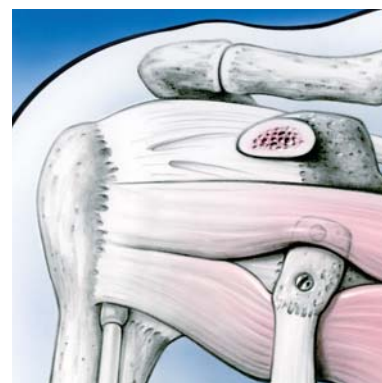
Unfortunately, the elegant arthroscopic Bankart method, with which an anatomic reconstruction is achieved, can not be used in all cases. The latest studies have shown that shoulder instabilities can lead to defect situations in the capsular ligament apparatus that cannot be treated adequately with the Bankart operation. When these cases were nevertheless treated surgically, there were frequent postoperative complications, above all the persistence of instability. A non-anatomical surgical procedure is then unavoidable. The following specific factors also determine the choice of method:

1. Major injuries of the bone structures, such as fractures of the joint socket.
2. Failed anatomical surgery.
3. Injury of the capsular ligament structure on the upper arm side.

In the case of a non-anatomical procedure, an existing anatomical structure is used to replace another structure that is no longer functional. In this case we use an operation named after the French surgeon Latarjet (see operation diagrams). The principle of the operation is that the coracoid, an osseous apophysis, with its appended tendons is separated from the shoulder-blade and fixed in the anterior joint socket area by a screw. This displaced bone fragment with its tendons can create anterior resistance that makes renewed instability almost impossible. Long-term clinical studies have shown that the shoulder remains stable in about 98% of patients after this type of operation. However, the same studies also showed that arthritis develops with greater frequency in the operated shoulder. Nevertheless, it is also known that arthritis can develop even earlier if the unstable shoulder is left untreated. Latarjet's operation thus gives the affected patients a functional and stable shoulder and can delay the possible development of arthritis by some years. The operation itself lasts for about 90 minutes and is performed arthroscopically.

Postoperative care

The operated arm should be immobilised in a sling for one week after the operation. Physiotherapeutic training then starts. The arm can be actively exercised again from the 6th day and its strength built up again. Physical work or sports training with heavy use of the arm can be resumed again from the 2nd-3rd postoperative month.



Injury of the anterior capsular ligament complex (Painful unstable shoulder)

The stability of the shoulder is maintained by a complex interplay between the passive stabilisers, the capsular ligament system, and the active ones, the muscles around the shoulder. The articular capsule is reinforced by three ligaments, an upper, middle and lower one. An unstable shoulder mostly involves the anterior part of the capsular ligament apparatus (see figure). The lower ligament in particular

is the one most frequently exposed to head-decentring forces and is thus the one most frequently injured. This injury is often accompanied by noticeable shoulder instability: the affected person regularly dislocates his shoulder.



More rarely there are isolated lesions of the middle and/or upper ligament. These injuries may be caused by a traumatic event, but sometimes a "stupid movement" is sufficient to tear these ligaments. One movement that is frequently reported is extension of the shoulder with forced outer rotation (e.g. when sitting in the front seat of a car and trying to lift a heavy object from the back seat to the front without turning around). Frequently repeated movements may also injure these structures, one then talks of microtraumas.

What are the signs of this type of injury?

Even if these ligaments are torn or damaged, the remaining stabilising structures are sufficient for the persons affected not to feel that they have an unstable shoulder. The main symptom is that the patient feels a pain that is usually triggered by a specific movement. This pain may also become continuous in advanced stages. Only in rare cases can this injury be detected by imaging procedures such as an MRI scan. Nevertheless, an MRI scan is usually performed if this condition is suspected, in order to detect any possible concomitant injuries. Because there are no definitive diagnostic signs and imaging procedures rarely provide conclusive evidence, these injuries often remain unrecognised and untreated. We call this condition an isolated **painful unstable shoulder**.

How is this isolated painful unstable shoulder treated?

Treatment is surgical by means of arthroscopy. As with all ligaments and tendons in the shoulder, the ligaments will never knit together by themselves in these cases either. In this operation, therefore, the ligaments are sutured together again and any concomitant injuries are also treated. The operation may last for up to one hour. After a night in hospital, most patients can return home the next day. Then follows a three-week phase of absolute protection of the arm, with the arm immobilised against the body in an arm sling. Physiotherapeutic rehabilitation can then begin, avoiding any outer rotation.

It has been observed that the shoulder can temporarily lose much of its movement after this type of operation, especially in relation to outer rotation. This state, which we call a "frozen shoulder" (see below), is only temporary and in no way adversely affects the results.

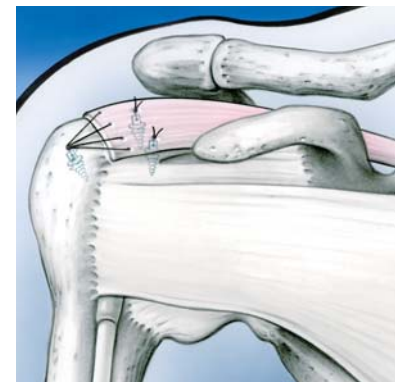
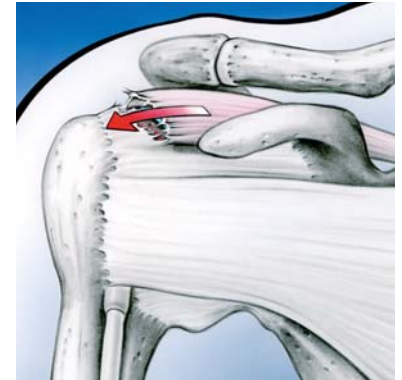
Rotator-cuff repair

As already stated in the anatomy section, the rotator cuff comprises a number of smaller muscles (subscapularis, supraspinatus, infraspinatus and teres minor). They ensure during arm movement that the humeral head does not slip out of the socket or press against the roof of the shoulder joint, at the same time constricting any soft parts lying in between. Lesions of the rotator cuff are a very common shoulder problem. To what extent the rupture arises acutely as a result of a strain or develops as a result of age-related degeneration can often no longer be said intraoperative. However, the symptoms in patients are very similar in both cases. Initially the function of the shoulder is restricted. Coarse motor capacity often recovers again, however, lifting movements above the horizontal often remain painful. Typical pains at night and at rest continue to occur.

If a rotator cuff rupture is suspected, a check is made during the examination to what extent individual subfunctions of the arm, such as the „apron-grip“ or the „neck grip“ are still possible. It is to be recommended that the size of the defect be quantified before the operation.

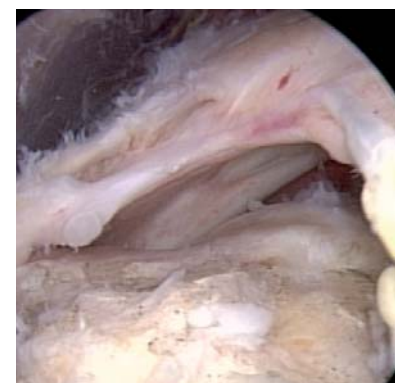
As a large part of the rotator cuff defects occur on account of a degeneration in the area of the tendon, it is indispensable for a later reconstruction to know how well the adjoining muscle and tendinous tissue is still preserved. For this reason, we carry out an MRI* examination in most cases. On the basis of the findings made and the discussion with the patient, one of the following procedures is applied.

** Magnetic resonance examination: With this method of examination, the patient is put into a tunnel-shaped electromagnet. In contrast to computer tomography, no x-ray exposure occurs for the body*



Arthroscopic rotator cuff repair

In this operation, as in other arthroscopic (keyhole) procedures, a camera is introduced through a small channel into the joint or into the bursa located above the joint. The instruments are inserted through additional working channels so that an open access to the shoulder is avoided and the surrounding structures are protected to a maximum extent. This has clear cosmetic advantages, on the one hand, and reduces postoperative pain and infection rates on the other hand. For these reasons, the aim is to perform all interventions by arthroscopy as far as possible. However, it has been shown that adequate mobilisation is often impossible due to fatty degeneration of the muscles. In this case a different procedure must be chosen.

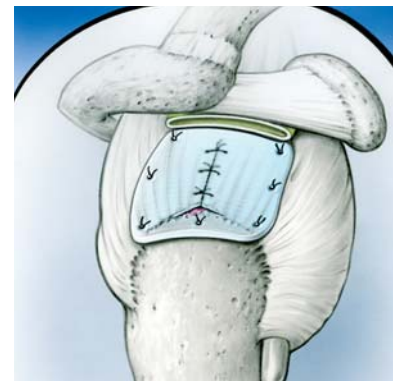


Normally, the degree of rotator cuff injury is evaluated after the arthroscopy. The actual operation is, however, performed a level higher in the bursa area. After bringing the optical system into the bursa, this is first removed so that the rotator cuff defect can be imaged. A burr is then used to smooth the head of the humerus in the area where the tendon was originally inserted. Threads are passed through the rotator cuff and are fixed to the bone by anchors (titanium or absorbable anchors, depending on the quality of the bone). Stitches are inserted and sunk in order to draw the rotator cuff to the area of smoothed bone substance. The gap in the rotator cuff can be closed tightly in this way and the tendinous part is brought close to the normal origin on the bone. In cases of inadequate quality of the tendon, above all in elderly patients, the tendon can be reinforced with a patch. The space under the acromion can then be widened if necessary. As in the open operation, the patient is given an abduction cushion. The postoperative treatment is largely the same with all surgical methods.



Patch reinforcement

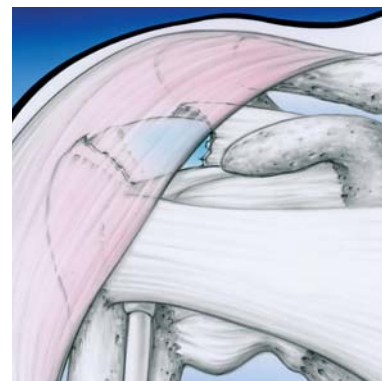
A patch is a piece of tissue made wither of human skin or a polyurethane tissue. This is a biotechnology with a promising future, an orthobiological implant that gives the reconstruction of the rotator cuff additional stability. Endogenous blood vessels and tissue cells are stimulated by growth induction in such a manner that they grow into the target area. As a result, the implant is transformed into endogenous tissue thus healing the defect situation.



Deltoid flap reconstruction

In the case of an anatomical reconstruction, the tendons are sutured to the head of the humerus again. However, if the gap is too large or the muscle already presents degenerative alterations, we carry out another reconstructive procedure. In this case a part of the deltoid muscle having the same direction of pull as the upper part of the rotator cuff is incorporated into the defect. Through this, living tissue which is well perfused is used to repair the lesion.

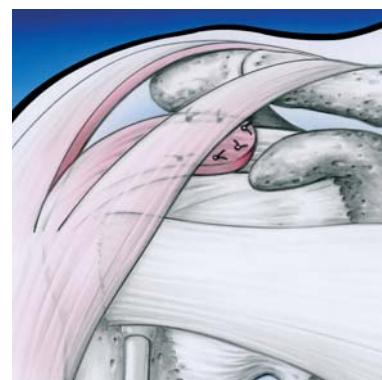
This is an open reconstruction procedure. The access is chosen in such a way that any possible degraded AC joint can also be removed here. Sometimes, we additionally cut through the acromion close to its base so that it can be turned up to some extent to create more room. After the defect has been excised and smoothed, a part of the greater tuberculum on the head of the humerus is removed. In this way we achieve a large, well perfused bone surface that allows the muscle flap to adhere. A triangular segment of the anterior part of the muscle is mobilised without severing the fibres. The muscle is then incorporated into the defect and continuously sutured with the rest of the rotator cuff. The operation is completed by fitting a Redon drainage and closing the wound. These patients are also given their abduction cushions in the operating theatre.



Postoperative treatment

The postoperative treatment of the reconstructive procedures is more or less identical. Depending on how much of the rotator cuff is reconstructed, the postoperative treatment is adapted accordingly. The abduction cushion is worn for 4-6 weeks. After one week, the patient has daily movement exercises with a motorised splint in order to move the shoulder passively. However, active mobilisation cannot be undertaken before the tendon has actually healed in place. After removing the cushion, the mobility is slowly increased by means of passive mobilisation and careful isometric (muscle tension) exercises. The tendon should have grown onto the bone after 8 weeks. Assisted active (supported) and fully active exercises can now be undertaken. Loading with weights should not be undertaken before the 10th-12th week. The ability to work varies greatly according to the occupational loading level. In some occupations without physical stress, a partial return to work can be possible already after removing the cushion. However, in physically demanding occupations, this will only be possible when a full load can be borne. Our experience has shown that rehabilitation after these shoulder interventions lasts for between 3 and 6 months. When the rotator cuff or reconstruction flaps have grown back successfully, sports activities can be resumed after 4 – 6 months. However, in this case also it must be mentioned once again that there can be great differences depending on patient's age, fitness level and the nature of the defect.

In the case of injuries to the subscapularis tendon and its reconstruction, the postoperative treatment changes in that an orthopaedic vest (gilet) and not a cushioning ensures the immobilisation. Also the motorised splint is not usually obligatory. In most cases, we dispense with any therapy for 6 weeks. However, after 6 weeks, the postoperative treatment is carried out as mentioned above.



Arthroscopic treatment of the long biceps tendon and the labrum (SLAP)

An injury, that was previously often overlooked and incorrectly interpreted, is the tearing of the long biceps tendon in the joint at the side of the joint socket. These lesions are rarely total ruptures. In most cases there is detachment of the upper ring, causing increased mobility of the biceps tendon anchor. These injuries often lead to pain when raising the outstretched arm. There may also be a worrying click or the patient may even suffer locking. These injuries can also be treated by arthroscopic surgery today.



During arthroscopy of the shoulder, the extent of the injury is determined accurately. Basically, there are two types of treatment. The first is to reconstruct the biceps tendon anchor again. If the biceps tendon is still in a good state and the anchor well perfused, the labrum can be fixed back onto the edge of the joint socket by mean of small bone anchors in the same way as used for stabilisation of the shoulder. The patient is given an orthopaedic vest already in the operating theatre. In contrast to labrum fixation, early mobilisation is possible during postoperative care. However, any stress on the biceps is absolutely forbidden for six weeks..

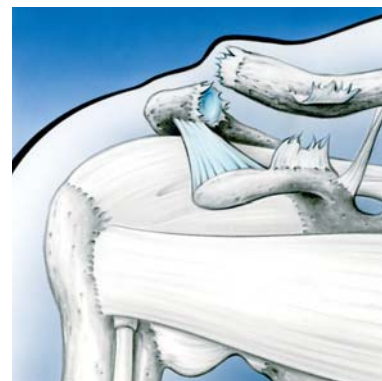
The second method of treatment is used if it is found during surgery that the biceps tendon is greatly thickened or frayed. In this case the biceps tendon may be severed. This is done either by a single cut (**tenotomy**) whereby the biceps tendon slides into the biceps tendon sheath in the hope that it will adhere there or the biceps tendon is fixed with small anchors or stitches in the tendon sheath area (**tenodesis**). Which of these two techniques is used, will depend greatly on the state of the biceps tendon and the level of activity and age of the patient. Often such decisions cannot be discussed with the patient in advance, especially since it is relatively difficult to assess the quality of the biceps tendon by MRI.

Rehabilitation after this tenotomy with or without fixation is identical to that after reinsertion of the biceps tendon. Here again, shoulder mobility can be obtained relatively early. However the biceps must not bear any strain for six weeks.

AC dislocation

An increasingly common injury, especially associated with sports, is traumatic displacement of the entire shoulder in relation to its suspension on the clavicle. The ligaments are torn between the coracoid process of the scapula and the clavicle and between the clavicle and the shoulder roof. The entire shoulder drops down. Inspection from the front shows raising of the clavicle. This disruption of the AC joint leads to lack of control of movements above the horizontal and with pressure loading along the arm axis (e.g. when pushing on the handlebars of a bicycle).

Depending on the severity of dislocation, the symptoms can arise immediately or be expressed as pain only after some time due to the development of arthritis or to destruction of the articular disk.



Arthroscopic AC resection

The AC joint instability is often slight, so that immediate stabilisation is unnecessary. In this case surgery can be deferred. However, if this incongruence leads to arthritis later or the articular disk is destroyed and causes pain, this condition can be treated by means of an arthroscopic operation.

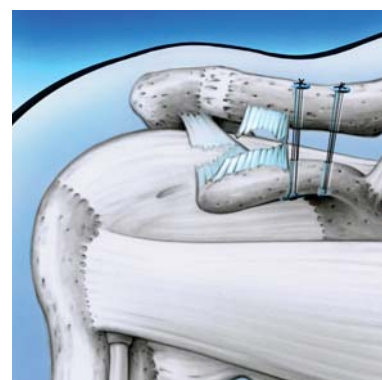
Depending on the degree of arthritis or disk damage, the AC joint may be accessed directly or by opening the bursa under the acromion. In the case of just disk damage, the disk may be removed arthroscopically in the same way as the meniscus in the knee. However, the lesion is usually associated with marked arthritis. In this case the cartilage is removed from the entire joint. A fibrous bond subsequently develops in the joint and assumes the function of this rigid joint. Apart from wearing a sling for a short time after the operation, postoperative immobilisation is not required. With physiotherapy, complete rehabilitation is achieved in about eight weeks.

AC reconstruction

In the case of a recent relevant rupture, an arthroscopic reconstruction procedure can be carried out in the first 6-8 weeks. Here the cartilage and constricted soft parts are removed from the injured AC joint. On the other hand, the distance between the coracoid process and clavicle is fixed by means of two arthroscopically fitted traction systems so that a cicatrisation of the torn ligaments can occur here immediately. As the ligaments must heal together in this time, the postoperative treatment is very careful.

An orthopaedic vest is worn for the first three weeks in postoperative treatment. Then increasing free movement of the arms is allowed. However, exertion can only be carried out after eight weeks, if the ligaments can be regarded as healed together in an x-ray check. Free sporting exertion is, however, only possible after 3-4 months.

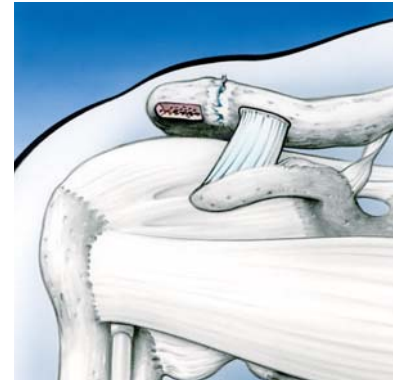
The traction systems fitted are very small and do not have to be removed any more afterwards.



AC reconstruction according to Weaver-Dunn

If this luxation is clearly unstable, the suspension of the shoulder has to be reconstructed. Ligament reconstruction is chosen for this. Previously, the torn ligaments between the coracoid and clavicle would be sutured together, but this did not prove to be effective so that today we use ligament transposition. For this, a ligament running between the coracoid and the acromion is used. This ligament is a survivor of human evolutionary development. This ligament is released from the acromion and is turned toward and sutured to the clavicle, which is exposed for this purpose. The advantage of this method is obvious. An endogenous ligament is used that is even still perfused. This operation is performed arthroscopically.

Post-operative treatment starts with 3 weeks of immobilisation in an orthopaedic vest. Then follows 5 weeks of rehabilitation of mobilisation without load-bearing. Depending on the patient's occupation, a partial return to work is already possible in this phase. Radiographic examination with weight loading is carried out after eight weeks. If this shows stable healing together of the ligament graft, unrestricted use can be permitted.



Compression syndrome of the Nervus suprascapularis

Compression syndromes of peripheral nerves occur at narrow parts of the anatomy. If a nerve passing through a bottleneck is additionally exposed to pressure, tension or shearing forces, this can lead to pain, paraesthesia and/or weakness of the muscular system of the area being tended. Paraesthesias are abnormal sensations, such as tingling or a feeling of numbness, such as everyone knows from a foot that has „fallen asleep“.

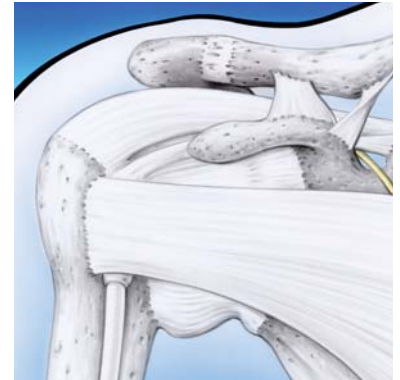
Considered anatomically, the nerves in the area of the shoulder usually run easily flexible in loose connective tissue. One exception here is the Nervus suprascapularis, a nerve of the arm plexus (Plexus brachialis). It runs to the upper edge of the shoulder blade and through a groove in the shoulder blade (Incisura scapulae) on its outside. In addition, this area is constricted by a ligament structure, the Ligamentum transversum.

The compression of the Nervus suprascapularis causes to a varying extent muscle wasting (atrophy) of the Suprascapularis and/or Infraspinatus, a reduction in strength for the abduction and external rotation of the shoulder as well as a vague shoulder pain. Losses of sensibility do not occur as a rule.

How is the compression of the Nervus suprascapularis remedied?

The treatment takes place operatively by means of an arthroscopy. This is a very modern procedure which can replace the open operation previously necessary for this. In this way, no important anatomical structures have to be cut, spread or even removed. It is possible to carry out the necessary operative steps in each case on the spot on the said constriction. A transection of the Ligamentum transversum, an extension of the osseous groove or simply just a reduction of the surrounding connective tissue can be carried out in a well-directed manner. This takes place with a corresponding careful treatment of the nerve and its associated vessels.

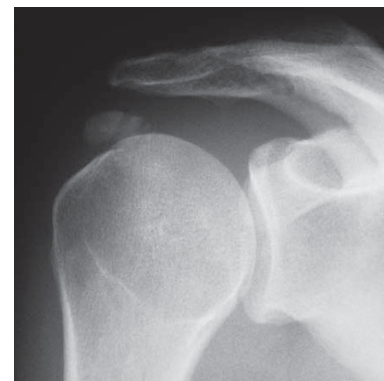
A further cause of the compression syndrome is a cystic displacement of tissue at the tear articular lip. Such a cyst or ganglion is concomitant symptom of existing structural damage in the joint (mostly SLAP lesions). The arthroscopic opening of the cyst through the glenohumeral area and the arthroscopic cleaning up of the lesion found in each case suffices here.



Tendinitis calcarea

Causes

Calcifications in the shoulder area (tendinitis calcarea) are very common. The cause of these calcified foci is, in the final analysis, unknown. Possible causes include calcification of focal bleeding in the tissues after injuries, or calcification of degenerative foci in the rotator cuff. However, what is certain is that the majority of these calcifications are of no pathological relevance. Shoulder calcifications are very often detected by chance in X-rays without there being any symptoms. The question therefore arises as to whether focal calcifications can, because of their shape, be considered responsible for a given disease or whether it can be predicted from their shape that they will or will not cause pain at a later time. On the basis of experience gained in examinations of large numbers of patients, calcification foci can now be divided into three groups. Type A involves single, rounded calcifications. Type B involves several small or large foci, but still rounded, and type C involves irregular calcifications. Apart from this classification, the localisation of the foci needs to be established accurately.



Treatment

Treatment of focal calcification is advisable only if symptomatic. This means if the calcifications either cause constriction under the acromion or give rise to sudden inflammations of the bursa under the acromion. This occurs, for example, if a calcification opens spontaneously, with spillage of its contents. Since the calcification is usually located in the rotator cuff, the contents are spilled into the overlying bursa. The calcium can thus be absorbed. Unfortunately, however, the irritation caused by the calcium leads to inflammation of the bursa. This causes acute pain. The calcification must thus be treated according to its stage. In the acute phase, when the calcium deposit has opened, the calcified material normally flows out and no longer needs to be removed. In this case, the acute inflammation has to be treated and, in addition, in the case of chronic inflammation of the bursa, this should be treated surgically. I personally undertake cortisone infiltration of the bursa in the acute phase. This gives a good chance of bursa recovery and regression of the pain. However, if the bursa has become considerably thickened and the inflammation has led to chronic scarring of the bursa, the latter has to be removed at some later time. This can be done arthroscopically. Using a camera and suitable instruments, the thickened bursa can be removed completely by means of two or three small puncture incisions.

However, patients very often show different pattern of complaints. Constriction under the acromion (impingement) leads to pain on movement in the horizontal plane and often also to pain at night. The actual cause of the pain is very often a thickening of the bursa. Even if there has been no prior spillage of calcified substance into the bursa, the latter can undergo prolonged mechanical irritation by the hard calcium deposit lying underneath it, with the result that it thickens. The calcium deposit itself only very rarely leads to impingement. It normally remains completely embedded in the rotator cuff. Just opening the calcium deposit will not lead to healing in these cases. The calcium empties into the bursa by itself and is absorbed. However, in this case the bursa is already thickened and will continue to lead to constriction. In this situation, only removal of the bursa in addition will resolve the symptoms.

In view of the aforementioned considerations, in individual cases we can prick the calcium deposit open by means of a needle under image intensifier (x-ray) control (Needling). In approximately 30% of cases this can lead to a healing. However, if the synovial bursa is thickened and the case history is too long, we decide rather for an arthroscopic revision.

Postoperative treatment

The postoperative treatment after endoscopic removal of the bursa is extremely simple. The postoperative swelling is treated with ice and drugs to reduce the swelling. A sling is also worn postoperatively. The patient may carry out active and passive mobilisation exercises until the threshold of pain from the first postoperative day. The treatment can normally be terminated after 2 – 8 weeks. The appearance of new calcifications is not more likely in patients who have previously had calcifications than in the average population.

Fractures of the shoulder

Fractures in the shoulder area have nowadays become more and more a field of treatment in non-acute accident surgery. Bone fractures in the shoulder area lead to perfusion problems in individual fragments. For this reason, in most cases we recommend an exact clarification of the fracture by means of computer tomography in order to determine the nature of the fracture lines and the location of the fragments. After that we let the fracture rest. In this way, we achieve a reduction of swelling of the soft parts in the fracture area. The tissue pressure on the small vessels is reduced and the perfusion becomes better. Furthermore, alternative blood streams can form, improving the perfusion situation in the fragments.

When the swelling of all the soft parts has subsided, an exact radiological clarification has been carried out in advance and, on the basis of the findings, an improvement in the fragment situation is to be achieved, then, after 3-4 weeks, an operation can be carried out, either performed as arthroscopic or open surgery. However, as each fracture is an individual case, I do not wish to give any further detailed explanations on this point.

Stiff shoulder (Frozen shoulder)

A frozen or stiff shoulder is a state in which shoulder movements are extremely restricted. This restriction of movement is due to swelling of the joint capsule, which can be caused by various factors:

1. **Prolonged shoulder pain**, irrespective of the cause of this pain.
2. *After operations on the shoulder, whether performed as open or arthroscopic surgery.*
3. *In extremely rare cases a frozen shoulder may develop without a prior traumatic or surgical event. The patients often have a metabolic disease such as a diabetes mellitus*

What can be done for a frozenshoulder?

Certain cells in the brain receive excess information sent via the nerves around the shoulder. Science cannot yet say why this occurs, but this information-overload leads to a short-circuit between the brain and the joint capsule. The result is swelling of the capsule. It is difficult to influence this reaction from the outside.

What are the consequences of a frozen shoulder?

Above all, the mobility of the shoulder is markedly restricted by stiffening of the joint capsule. Any attempt to move beyond the restricted limit of movement is painful and intensifies the short-circuit reaction and should thus be avoided as far as possible. The time this condition lasts varies from one patient to another, but it can persist **for over a year**. The postoperative rehabilitation phase can be clearly prolonged.

What are the long-term consequences of a frozen shoulder?

A frozen shoulder can persist for up to 18 months and greatly restricts everyday activities. However, in **almost all cases there is complete recovery**. This means that complete function and mobility is restored in the end. It has been noted that patients with a postoperative frozen shoulder achieve even better results than patients without this complication.

What can be done for a frozen shoulder?

First and foremost is absolute protection of the shoulder. Any movement therapy should be stopped because any stimulus from outside aggravates the condition. When the shoulder freezes, this means that it wants to be rested, and this is what we should do. The inflammatory reaction can be countered by non-steroidal antiphlogistic or cortisone anti-inflammatory drugs. There is also a hormone (calcitonin) that is administered by nasal spray which can reduce the severity of a frozen shoulder if the symptoms are recognised early enough. Unfortunately there is still no medicine that can resolve this condition fully. Patience often becomes exhausted in a condition such as this, but it is a virtue that must not be lost during this long period of time. The shoulder is giving out a signal, and we should work with the shoulder, not against it. Only with this approach can the duration of stiffness be reduced.

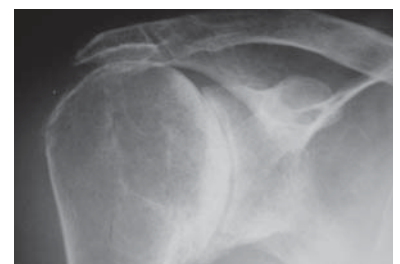
Cuff capture

In contrast to a stiff shoulder, cuff capture or adhesion of the shoulder is a clinical picture which very seldom recedes spontaneously. In this case, adhesion occurs in the joint or between the individual muscles on account of the blood during the accident or during the operation. In contrast to a stiff shoulder, these adhesions do not dissolve. Patients with adhesions typically have perceptible **pains at night**. However, in contrast to a stiff shoulder, the **rotational movements of the arm are often less restricted**.

In the case of adhesive shoulders, an operative solution is often the only way out. In such a case the joint is examined once again with the camera and the individual adhesions are transected. The patient can then move freely again immediately. There is no immobilisation and the success of the operation becomes apparent mostly within a few days or weeks.

Osteoarthritis of the shoulder-joint

Primary or secondary arthritis can also develop in the shoulder area. This means that the joint surface, which is normally covered with cartilage, becomes disintegrated. Prosthetic care has been available for arthritic hips and knees for some time. Of course, this type of treatment is also available for the shoulder. However, since the shoulder is a very mobile joint, the prostheses are often imperfect in terms of function. The aim of a shoulder prosthesis is to provide freedom from pain and adequate movement up to the horizontal plane. A prosthesis is thus primarily indicated for patients with a greatly restricted shoulder function. For example, this type of treatment may be necessary after fractures or severe progressive joint destruction. Depending on how well the rotator cuff is maintained, anatomical care can be provided by means of a prosthesis that matches the joint. If, however, the cuff is inadequate, a reverse prosthesis has to be inserted.



Reverse prosthesis

If the rotator cuff is destroyed, an anatomical prosthesis cannot be inserted. This is because if the rotator cuff is defective, the prosthesis will also move forward again and thus lead to further pain and poor function. To prevent this, a reverse prosthesis was developed some years ago. In this prosthesis a hemisphere is incorporated in the joint socket and a semi-oblique socket with a shaft is placed on the head of the joint so that there will be no upward luxation when the large deltoid muscle pulls. The centre of rotation is shifted by this and the leverage of the large deltoid muscle is improved in order to make it possible to move the arm without the rotator cuff. Active movement can start after muscles detached for the operation have healed together again which usually takes 4 – 6 weeks. One disadvantage of this prosthesis is that the anatomy is completely changed. If this prosthesis shows signs of loosening, it cannot be readily replaced. However, in the absence of complications, good function up to above the horizontal can be achieved with a Grammont prosthesis.



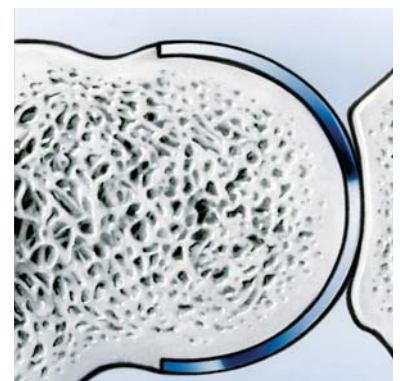
Anatomic prostheses

If the rotator cuff is well preserved, but the joint surface completely destroyed, an anatomical prosthesis in the form of a normal head can be inserted. Depending on the case, there is a choice between two different types of prosthesis.



Resurfacing

In this prosthesis, the head of the humerus is exposed through a small access. The joint surface is then shaped smoothly with a rasp and the cartilage removed. Only the surface of the joint is then replaced by a metal cap. As a result, the biomechanics of the upper arm are as good as unchanged. The operation is relatively minor and almost painless. However, since the front part of the rotator cuff has to be detached for the operation and then be reinserted, the arm is immobilised in a sling for about six weeks. The front part of the rotator cuff is then healed together and the arm can be actively moved.



"I personally always insert this type of prosthesis whenever possible."

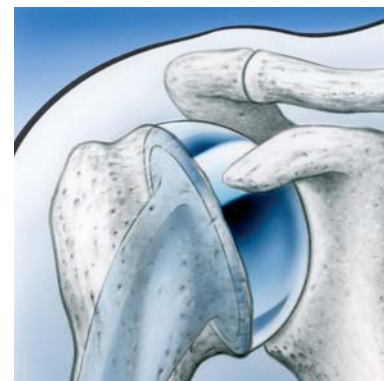
Shaft prosthesis

As can be seen in the picture, the shaft prosthesis is similar to that used in the hip. This prosthesis is sunk deep into the shaft of the humerus.

For this, the head of the humerus is exposed and removed. A metal stem is then inserted into the humerus as an anchor and a metal head of suitable size is set on it. Naturally, this operation is rather more extensive and also more painful. However, there are cases that require this type of prosthesis, especially when there is a fracture present.

Rehabilitation is similar to that after resurfacing. Here too, a part of the rotator cuff musculature has to be detached and has to grow back again after reinsertion before active movement can take place.

Complete rehabilitation takes about 3 – 6 months after both types of prosthesis.



Postoperative rehabilitation

As you can see from this brochure, there are very many different types of operation on the shoulder. So it is clear that the postoperative treatment can also differ greatly. The treatment can be discussed in rough outline with the patient before the operation. However, the postoperative treatment in detail will only be adapted to the definitive findings of the operation during and after the procedure. It is thus clear that different postoperative procedures will sometimes apply for apparently like operations.

Your neighbour did not have the same operation that you had!!

Many well-meant pieces of advice and recommendations from your friends or acquaintances should be treated with caution. If you should have the feeling that your treatment is possibly not in accordance with your ideas, I would ask you to please discuss the matter with me before you start following other people's therapy recommendations on your own.

After your operation, you will be given a leaflet giving you the most important tips. However, the most important thing for you is that the rehabilitation should be at all events painless or with little pain. If pain does occur unexpectedly during rehabilitation or through the immobilisation, I would ask you to please inform us directly.

Closing remarks

I hope you liked this short excursion into shoulder surgery.

Some of your questions have possibly been answered. Some other will have arisen because of this text. Please do not hesitate to discuss these questions with me before any possible treatment.

As you know, problems can be treated in different ways. My types of treatment are in accordance with my treatment philosophy and have developed in the past few years through my personal experience and that of others.

I would specially like to thank my teacher, Dr. Laurent Lafosse, whose great experience has often helped me.

I will also continue to adapt my treatment strategies to the latest findings.

Thank you very much for your interest
Dr. med. Jan Leuzinger



Dr. med. Jan Leuzinger