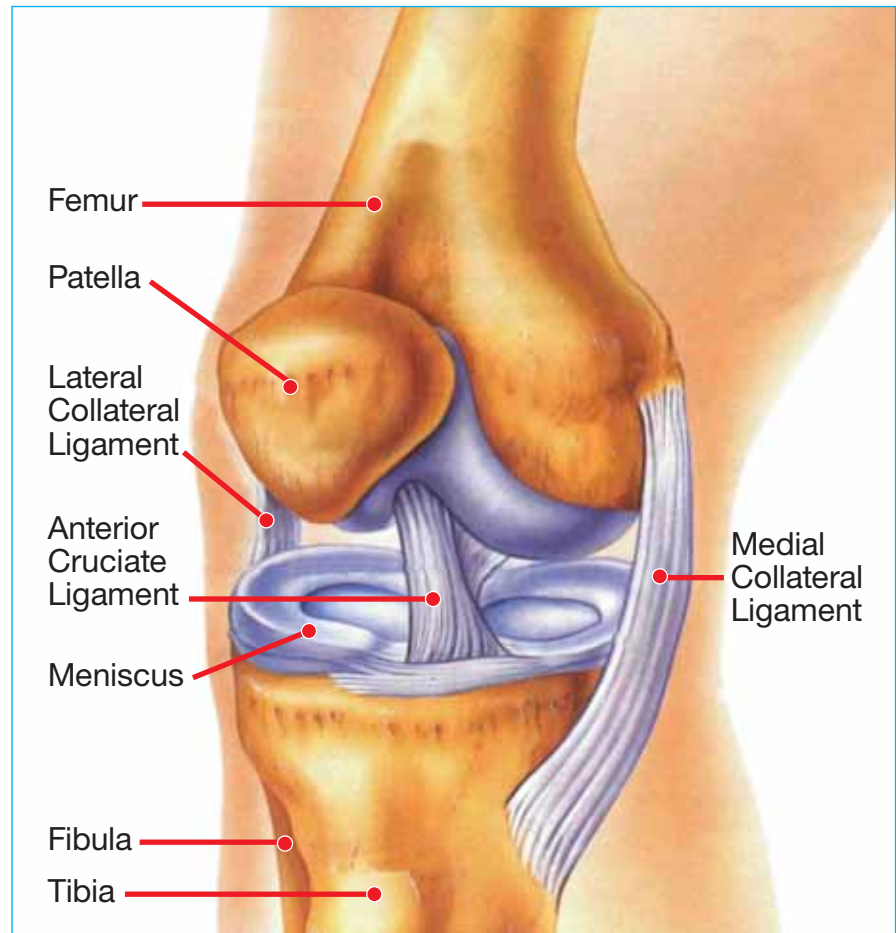


# Knees up!

In terms of our yoga practice, the knee is often one of the biggest problem joints of the body. Knee injuries are the most common of all yoga injuries, and once damaged, knees present ongoing difficulties for yoga practitioners. However, with a little care and attention, most knee problems in yoga can be avoided. The following are some suggestions to prevent knee injuries arising, and to assist in rehabilitating existing knee injuries, whatever their origin.



The knee is one of the most important and most complex joints in the body, but is also the most vulnerable. It is highly flexible, yet acts as a shock absorber, and has to bear almost the entire body's weight. It also has to provide postural stability and to do this it has a complex interaction of bones, muscles, ligaments, and tendons.

The bones which make up the knee are the femur (thigh bone), tibia (shin bone), fibula (smaller bone on the outside of the main shin bone), and patella (knee cap). The knee joint is in fact two joints in one: a joint between the femur and tibia, and another between the femur and the patella. Unlike other large joints in the body, there is no actual interlocking of the articulating bones, and there is no independent joint capsule that encloses the whole joint. This means that most of the stability of the joint comes entirely from the soft tissues – the cartilages, tendons, and ligaments that bind and align the knee joint.

The important structures of the knee and their functions are:

- **Medial and lateral meniscus**

These are C-shaped discs of cartilage that sit one on top of each other between the articulating surfaces of the femur and tibia. They cushion the ends of the bones to stop them wearing, and provide shock absorption for the joint.

- **Collateral ligaments**

The medial (inner knee) and lateral (outer knee) collateral ligaments are like fibrous straps joining the bones together on the inside and outside edges of the knee joint. Their job is to keep the knee secure in the straight position, and to align the bones of the knee properly in the bent (flexed) position.

- **Cruciate ligaments**

The anterior cruciate ligament (the one that crosses in front) and posterior cruciate ligament (the one that crosses behind) criss-cross inside the knee joint, binding the femur and tibia strongly together. They also slide the tibia back or forwards as the knee bends and straightens to keep it beneath the end of the femur bone.

### Common causes of yoga-related knee injuries

One thing that needs to be clear in relation to all joint injuries is that joints should be stable – it is muscles that we want to stretch, not joints. Ligaments are the fibrous connective tissue designed to bind bones to bones, and give joints their stability. Ligaments are NOT meant to stretch much. Also, they have limited blood supply; if torn, they take a long time to heal.

The knee is a synovial hinge joint, and allows a good range of extension and flexion, but only limited medial and lateral rotational (inward and outward twisting) movement. Because of its limited medial and lateral movement, it is very susceptible to injury in sports such as skiing and football.

### How do we injure the knee in yoga? Padmasana (Lotus) and Ardha Padmasana (Half Lotus)

In yoga, the most common injury is due to students going too far into, or using force to achieve certain positions. Padmasana (Lotus), or other seated positions in which one or both knees are



If the knee easily points towards the floor, there is enough hip flexibility to move into the forward bend without endangering the knee. **Correct.**



If the knee points away from the floor as shown, moving into the forward bend will create dangerous twisting of the knee joint. **Incorrect.**



Shows knee rolling inwards and arch of the foot collapsed in Triangle. **Incorrect**



Using a block beneath the ball of the foot can help stabilise the vastus medialis muscle and improve the alignment of the knee. The kneecap should point towards the centre of the foot and the arch of the foot should be lifted. **Correct.**

bent and out to the side, are especially dangerous for the knee. Examples of these are Head to Knee Pose (Janu sirsasana), Cobblers Pose (Baddha konasana), or any legs crossed sitting pose. In these postures, it is the hip that needs to be flexible enough to create the majority of the rotation required of the thigh. (Ankle flexibility also plays a part.) If the hip is not flexible enough to take the majority of the rotational movement, what happens? The knee becomes the ‘weakest link’ and must do a lot more twisting than is good for it! If a forward bend is then attempted, strain or tear to the medial collateral ligament, and/or the anterior cruciate ligament is likely.

As a rule of thumb, in Half Lotus Pose, the foot should easily rest on the thigh, and the knee should point down towards, or even touch the floor before any forward bend can safely be attempted.

In any other sitting position where the knee is bent and out to the side, if the knee points upwards from the floor, extreme caution should be exercised in any forward bending movement. ANY pain or sensation of stretch in the inner knee is to be avoided.

To alleviate strain on the knee in these postures, work on hip flexibility in postures such as leg crossed hip stretch\*. Use as many folded blankets beneath the sitting bones as are needed to promote a downward direction to the bent knee, before going into a forward bend; and go forward only as far as is possible without feeling a stretch in the inner knee.

### Misalignment of the knee in standing poses

Many knee problems are caused by prolonged practise of standing postures with the knee misaligned. If the knee rolls inwards in postures such as Triangle Pose (Trikonasana), or falls inwards in a bent knee poses such as Warrior II (Virabhadrasana II), the medial collateral ligament can become strained, and the medial meniscus can become worn. Though knee misalignment can be caused by the actual shape of the bones, it is more commonly caused by poor alignment of the hips, and muscle imbalance. To keep it aligned, the knee joint requires that muscles maintain alignment, the

Most of the stability of the joint comes entirely from the soft tissues – the cartilage, tendons, and ligaments that bind and align the knee joint.



Lunge, showing knee slightly hyperflexed, which may squash the medial meniscus and over stretch the knee joint. **Incorrect.**

quadriceps femoris (front of the thigh), gluteus medius (inner buttocks), and vastus medialis (inner thigh) are strong enough, and the surrounding muscles and structures (hip flexors, hamstrings, outer thigh muscles, and ankles) are flexible enough, to maintain the correct muscle balance. One muscle group that is commonly indicated in knee misalignment is vastus medialis, part of the quadriceps group of muscles located in the inner thigh. When this muscle is not 'switched on', the knee does not align properly when moving from bent to straight position. Over time, this can wear and damage the medial meniscus, a common cause of knee discomfort.

To correct the problem in straight leg standing poses such as Trikonasana, allow the hips to move naturally, so that the back hip may roll slightly forwards. (Keeping the hips absolutely square to the long edge of the mat in Trikonasana tends to encourage the knee to roll inwards.) Make sure that you externally rotate the thighs (bringing weight to the little toe side of the feet, while grounding the ball of the foot, and lifting the arches). Avoid locking the knees in Trikonasana, as hyper-extension of the knee joint will also mean that vastus medialis cannot 'switch on'. Using a block beneath the ball of the front foot and pressing into it can also help stabilise vastus medialis in straight leg standing postures.

To activate vastus medialis (and strengthen quadriceps femoris and gluteus medius), in the bent leg standing poses such as Warrior II, try slowly



Keeping the knee at an angle of more than 90 degrees helps to prevent damage to, or aggravation to, a previously damaged meniscus. **Correct.**

bending and straightening the knee in and out of Warrior II. In dynamic standing lunges,<sup>6</sup> keep the knee perfectly aligned over the foot (i.e. make sure that the inner knee does not start to point towards the big toe at any stage during the process).

#### **Hyper-flexion of the knee in bent knee standing poses, lunges etc**

The knee is at its most stable when it is straight, and the more it bends, the less stable it becomes. When practising standing poses with bent knees, when the full weight of the body is being supported by the knee joint, it is important to maintain as much stability in the knee as possible. Those with perfect alignment (inner knee does not fall in) are safe to bend the knee to 90 degrees in a posture such as Warrior II. Bending the knee past the 90 degrees mark brings seven times more pressure into the knee joint. Even in postures such as lunges, I prefer to see students keeping the angle of the knee at more than 90 degrees, to prevent squashing the meniscus inside the knee and overstretching the joint. To achieve this, take the foot further forward in a lunge, or wider apart in Warrior II (or just bend the knee less.)

#### **Specific knee injuries and their management**

The most common major knee injuries that occur are the anterior cruciate ligament (ACL) and the medial collateral ligament (MCL) becoming strained, torn, or ruptured; and the medial meniscus becoming damaged or torn.

Many knee problems are caused by prolonged practise of standing postures with the knee misaligned.

### **Prevention and management of knee injury**

#### **General 'do's and don'ts'**

- Practise good alignment of hips, feet, and knees in standing poses.
- Don't let knee roll inwards in straight leg standing poses – use a block beneath ball of foot.
- Don't hyper-extend or lock the knees in straight leg standing poses.
- Don't let knees fall inwards in bent knee standing poses.
- Don't hyper-flex the knee joint (past 90 degrees) in bent knee standing poses or lunges.
- Create flexibility in hips and ankles – knee rotations, legs crossed hip stretch, with no strain on the knees.
- Build strength in quadriceps and vastus medialis – Yogi's armchair, dynamic squats, and lunges, Locust Pose (Salabhasana), and Warrior Poses with good alignment.
- Don't strain into Padmasana.
- If knee is injured, do not attempt to stretch or strengthen until acute phase (heat, redness, swelling, and sharp pain) has passed.
- In acute phase, use RICE treatment (Rest, Ice, Compression, Elevation).
- Use strapping and/or compression bandage.
- See a physiotherapist or senior yoga therapist.
- See Knees Vinyasa Issue 28 of AYL.



Virasana with a bolster beneath the sitting bones and a spacer behind each knee to maintain space in the knee joint.

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#### Anterior cruciate ligament (ACL) strain

Seventy percent of all serious knee injuries involve damage to the ACL, and it is very common in contact sports such as football. In a yoga context, the ACL can be strained, or torn, by impact to the knee, e.g. practising drop-backs, and straining in Padmasana and similar postures. (See above).

If injured, the Virabhadrasana series, and all bent-knee standing poses, should be avoided in the acute phase. When mostly recovered, the knees should be bent only minimally in these poses until no more pain is felt. In rehabilitation, hamstring strengthening postures, e.g., Locust Pose (Salabhasana) help to stabilise the ACL. Practise straight leg standing poses with the knees very slightly bent to switch on the hamstrings, thus stabilising the ACL.

#### Medial collateral ligament (MCL) strain

This injury can be caused by poor alignment of the knees in standing poses (see above) and also forcing the knee into a bend with a lateral twist such as Padmasana. The internal hip rotations such as Hero's Pose (Virasana) can also strain the MCL; avoid this pose completely in the acute phase. To prevent strain, modify Virasana by using more height beneath the sitting bones, such as a bolster, and allowing the knees to come slightly apart. Also, practise Mountain Pose (Tadasana) and Legs up the Wall Pose (Viparita karani) with a block between the inner thighs and a belt tightly around the thighs. Practising all standing poses with a block beneath the ball of the front foot will help to rehabilitate the MCL.

#### Meniscal damage

Among the most common types of knee injury is medial meniscus damage. It is most commonly caused by flexing the knee to its full extent, and then twisting (as in Padmasana and Ardha Padmasana). Tears to the anterior (front) medial meniscus are easily aggravated by any posture that closes the knee, such as leg crossed sitting positions and Janu Sirsasana or Virasana, which can squeeze or jam the anterior medial meniscus. Often a ragged piece of the torn meniscus gets stuck in the joint space, which can be very painful. Medial meniscal damage is much more common in individuals with under developed vastus medialis muscles, so strengthening this muscle group is important. (See Misalignment of the knee in standing poses section above)

Tractioning the knee in bent knee position, or using spacers to create space in the joint, can provide relief from pain caused by medial meniscus tears.

If the medial meniscus is torn or damaged, avoid any postures that ask the knee to move into full flexion, e.g. Garland Pose (Malasana), Janu Sirsasana, Virasana, or even sitting cross legged. The sitting postures mentioned can be made approachable by using more height beneath the sitting bones and using spacers to create space in knee joint. For rehabilitation, build strength in vastus medialis in Yogi's Armchair (modified Utkatasana) with block\*, and externally rotate thigh in Trikonasana.

#### References

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