Information sheet pediatric orthopedics

Axis deviations of the legs

The term axis deviation of the legs means the legs are either knock-kneed or bowlegs, the first being very common and the latter less common. In knock-kneed legs, the load axis of the leg runs through the outer part of the knee joint on the way from the center of the femoral head to the middle of the upper ankle joint. In bowlegs the load axis runs through the inner part of the knee joint. Depending on the age, axis deviations can be normal: In the first two years of life, bowlegs are usually present; until the 8th to 10th year of life the leg axis is mostly valgus (knock-kneed); after the age of 10 years the legs should be more or less straight.

How do axis deviations of the legs occur ?

The development of knock knees between the ages of 8 and 10 is often associated with obesity. Knock-knees are only rarely found in children or adolescents who are slim or of normal weight. In those patients they are mostly “a whim of nature” but can occasionally also be found in the context of a family predisposition. Bowlegs are typically found in boys or young people who play football, trivially one speaks of "football legs". The reason for this remains a mystery...

Of course, there are also cogent reasons for an axis deviation. However, these are relatively rare:

- Fractures close to the joint can lead to an axis deviation due to a one-sided stimulation of growth.
- Fractures with involvement of the growth plate can result in an axis deviation or leg length difference due to a partial or complete closure of the plate after fracture healing.
- Similarly, inflammation, infections or tumors, depending on the location, can stimulate or slow down the activity of the growth plate.
- Metabolic diseases - primarily all forms of rickets (softening of the bones) - are also associated with axial deviations (mostly bowlegs).
- Congenital growth disorders - usually associated with short stature - often lead to marked knock knees or bowlegs.

What does an axis deviation of the legs lead to ?

If the axis of the leg does not run through the middle of the knee joint, the joint is put under improper stress. In knock-knees the outer part of the knee joint is stressed too much, whereas in bowlegs the inner part is stressed too much. Pronounced knock knees or bowlegs can therefore be the cause of premature joint wear or osteoarthritis. The chance of developing an osteoarthritis is significantly higher in bowlegs compared to knock knees. Naturally this doesn’t occur at the age of our patients, but only later, starting at the age of 30 or even 40. So-called overload complaints on the outside or inside of the knee joint are also rarely seen in children.

In accident-related meniscus tears or cartilage damage on the outer part of the knee in knocked legs or on the inner part in bowlegs, healing of the injury is limited or impossible even if the problem is addressed surgically. In these cases, it is therefore necessary to not only address the meniscus or

cartilage injury, but also the problem of malalignment. This must also be considered in children or adolescents with osteochondrosis (death of the bone immediately below the cartilage, possibly associated with cartilage softening or damage!).

How is an axis deviation of the legs verified ?

Clinically, the distance between the ankles in knock-knees, and the distance between the inner limits of the knee joints in bowlegs can be measured and quantified. The correct diagnosis and measurement of the malalignment is based on an x-ray image of the whole leg, preferably acquired in the so-called EOS, an x-ray device producing only a low radiation exposure. This X-ray image can be used to determine the deviation of the load axis from the center of the joint. With this image the cause for the axis deviation can also be determined (if it is the thigh bone and / or the shin).

What can you do about it ?

There are no conservative options for correcting axis deviations. The use of insoles or a sole construction with an increase on the inside for knock knees or on the outside for bowlegs leads to an immediate visual correction of the axis. However, no permanent correction is achieved. The use of such an insert or sole construction can occasionally be useful for example in the case of osteochondrosis, to reduce the stress on the affected knee compartment and prevent an immediate surgical intervention.
If the load axis clearly deviates from the center of the joint in the X-ray, the indication for axis correction is given in the sense of temporary growth control or temporary epiphysiodesis (see below). Since the risk of developing an arthrosis is higher in the bow leg than in the knock-kneed leg, bowlegs are corrected somewhat more generously than valgus ones.
It is sometimes difficult to determine the time of such a correction. In the much more frequent knock-kneed axis, we always wait until after the age of 10 with the surgical correction, in girls, depending on physical development, up to the age of 12, and in boys even longer. This is because if the axis is corrected too early, a knock-kneed leg can develop again as part of residual growth. This is particularly the case in obese patients and if correction is carried out quickly as part of growth control (see below).
In the case of very severe malalignment, where improvement is no longer expected through normal growth, correction can also be carried out earlier and, if necessary, repeatedly.

What is done during an operation ?

As a rule, growth control or epiphysiodesis is performed. During this operation, a small plate with a screw on both sides of the growth plate (see Fig. 1) is inserted through a small incision in the skin on the inner side of the knock-kneed leg and on the outer side of the bowleg, depending on the location of the growth defect on the femur or tibia (occasionally on both!). This plate acts like a clamp and slows growth on the operated side. On the opposite side, growth remains normal. This results in a slow correction of the leg axis over a period of months (see Fig. 2). As soon as the desired correction is achieved, the plate is removed and the leg can continue to grow normally.

Instead of inserting a plate over the growth plate, a definitive closure of the growth plate can also be performed by means of a so-called drilling epiphysiodesis. As a rule, we recommend this procedure primarily for the correction of leg length discrepancies, and hardly ever for the correction of axis discrepancies.
Only rarely is a correctional osteotomy of the thigh or shin bone needed to correct knock knees or bowlegs. This is primarily done in the case of extremely pronounced deformities (usually in the case of an additional rotational defect of the corresponding bone or an extension deficit or overextension of the knee joint) or when growth has already been completed.
Correction in the sense of temporary growth control or epiphysiodesis requires sufficient growth potential and must therefore not be indicated too late!

What are the risks of growth control or epiphysodesis ?
The main risk is a wound healing disorder or a wound infection. Occasionally there is also persistent pain with concomitant restricted mobility because the plate irritates or is perceived as irritating. Fortunately, this is rare. Physiotherapy may be necessary if such a situation occurs.
There is rarely a problem with the implant (loosening, screw breakage) or an undesired overcorrection. We have never observed a theoretically permanent damage to a growth plate.

What does the follow-up treatment look like after an operation ?
The growth control or the epiphysodesis is considered a "minor operation". Since the patients usually have local pain after the operation, we still hospitalize them for one night (occasionally two nights!) for pain management and mobilization on crutches. For two weeks after the operation the patients have to walk with crutches. After that, normal weight bearing including sports is possible. We only prescribe physiotherapy if the mobility of the knee joint does not normalize spontaneously within two to a maximum of 4 weeks.
To monitor the correction, we perform a clinical check-up after 3 months and a clinical and radiological control after 6 months. The time interval of the subsequent controls is adapted to the course.
As soon as the axis has been corrected (in the case of knock knees, we usually aim for a slight overcorrection, because of the risk of recurrence), the plates are removed in an outpatient procedure. Subsequently, rest is again necessary for about 2 weeks.
Of course, there will be subsequent follow-up checks until the growth is complete. The primary concern here is to exclude the occurrence of a renewed axial deviation (primarily the occurrence of a renewed knock-kneed leg!), the so-called rebound phenomenon.