UNDERSTANDING YOUR OPTIONS

LIMB LENGTH DISCREPANCY

This booklet provides general information about limb length discrepancy and treatment options for you to discuss with your physician. It is not meant to replace any personal conversations that you might wish to have with your physician or other member of your healthcare team. Not all the information here will apply to your individual treatment or its outcome.
Limb Length Discrepancy

Unequal Limbs
A person may limp when lower limbs are not the same length. When the difference between limbs is bigger, the limp is worse, which can cause back pain and a significant curve of the spine.

If the difference between limb lengths is small, a person can hide his/her limp by tilting the pelvis, which can cause a slight curve of the spine. If the difference is more than 3/4”, it is difficult to tilt the pelvis enough to hide the limp. In such cases, a shoe lift can level out the pelvis and get rid of the limp.

Limping causes abnormal pressure on the joints and can lead to painful arthritis of the spine, hip, knee, and/or ankle, if left uncorrected.
What is a Limb Length Discrepancy (LLD)?

A limb length discrepancy (LLD) is a difference between the lengths of the upper and/or lower limbs.

If the lower legs are equal in length, but one thigh bone is shorter than the other:
- Both knees will still be at the same height.
- The pelvis will be tilted.
- The spine will be curved.

If one lower leg is shorter than the other:
- The knees will not be at the same height.
- The pelvis will be tilted.
- The spine will be curved.

How Common is it?

LLD does not cause a problem for everyone who has it, though it is more common than you think. Below are some studies that show how many people have lower LLD:
- One study found that up to 90% of people had about 1/4” difference between lower limb lengths.¹
- A study of military recruits saw differences of 1/5” to 3/5” in lower limb lengths.²
- A survey of long-distance runners showed that almost 40% have a small amount of lower LLD.³
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What Causes Limb Length Discrepancy (LLD)?

There are many causes of LLD. Some include:

**Being Born with it**

Some babies are born with a LLD. The difference can be small at first, but can increase significantly over time. In some cases, the limb length difference remains the same during growth (called static LLD); but in most cases, the difference worsens as the child grows (called dynamic LLD). In extreme cases, some babies can be born with part of their lower limb missing.

**During Growth**

Most babies are born with equal limb lengths; however, this can change due to injury or illness, which can cause a major LLD. Causes of such injuries or illnesses include:

- **Growth plate injury** – Bone gets longer through a special cartilage zone called a “growth plate.” Each end of a bone has a growth plate. If a growth plate is injured, a bone may stop growing at that end. This type of injury may not be noticed at first, but will show over the years as the limbs grow at different rates.
- **Infections and diseases** – Bone and joint infections can permanently damage growth plates. If the growth-stopping infection occurs on one side during infancy, a limb might end up significantly shorter than the normal side.
- **Joint inflammation (juvenile arthritis)** – This affects 70,000-100,000 (active and inactive) children under age 16.

**After Injury**

A broken leg bone may heal and result in shorter-than-normal length.
What Are the Signs and Symptoms?
There are some common and not-so-common signs of having a LLD. As noted from the studies mentioned earlier, it is possible that you are not aware of a slight difference in your limb lengths, but a big LLD may cause any of the following:

- Pain caused by curvature of the spine.
- Toe-walking on the short side and limping.
- Pain in the spine, hip, knee, and/or ankle.

WHAT CAN I DO ABOUT IT?

Your Options…
If your doctor told you that you have a LLD, there are several things you can do. Make sure you discuss with your doctor which option is best for you.
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Nonsurgical Treatment

Do Nothing
There are many people who have a small amount of LLD and do not have any pain or discomfort.

Shoe Lift

If your leg difference is uncomfortable or causes pain, the most common nonsurgical treatment is a shoe lift, which equalizes limb lengths. Every pair of shoes worn must have the lift, and sometimes custom-made shoes are required.

Shoe lifts range from around $10 (simple inserts) to more than $100 for custom-made shoes with heel and sole lifts.

Shoe Lift Risks
A medical risk associated with shoe lifts is the possibility of sprains and broken ankles due to balance issues, especially as you get older. Additionally, it can be an expensive choice to fit every pair of shoes.
Surgical Treatment
Growth Arrest

In children whose bones are still growing, lower limbs can be made equal in length with surgery that slows down or stops the growth of the longer and good limb.

Growth arrest will not instantly fix the limb length discrepancy. Instead, the limb length discrepancy slowly evens out as the short limb catches up, which may affect the patient’s full potential adult height.

Growth Arrest Risks
Sometimes, the longer and good limb may be slowed down too much. If this happens, the shorter limb will end up being longer.

- Restriction of bone growth may result in less-than-full potential adult height.
- Possible over-arrest of shortened leg may result if patient does not follow up to “turn off” the arrest.
- Surgeon may need to adjust the length of the longer and good limb if legs do not end up being even.
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Surgical Treatment

Bone Shortening
In some cases, the longer limb can be shortened. The longer bone is cut, and a section is removed. Then, the ends of the cut bone are joined together. During healing, fixation is necessary in order to hold the bone in place. Either a metal rod is inserted down the center of the bone, or a metal plate with screws is placed on the bone.

If too much length is removed from a bone, muscle strength can decrease permanently. This procedure will make a person’s full potential adult height shorter than if the other leg were lengthened to equalize the two limbs.

Bone Shortening Risks
- Muscle weakness may result.
- Patient’s adult height will be shorter than his/her full potential height.
- A non-union, when a bone fails to heal, might occur.

Growing New Bone
The body is able to regrow or repair bone through a natural process called osteogenesis. This can be done through a lengthening procedure with either an external fixator or an internal device. By gradually moving two segments of a bone apart, the body will fill in the missing space with new bone. After new bone forms in the distraction zone, it will enter the consolidation phase. Once the bone has fully consolidated and achieved stability, the new bone will be as strong as the original bone.
Surgical Treatment

External Fixation

Bone can be lengthened by affixing an external frame to the leg. The external fixator is connected to the bone through the skin with wires, pins, or both.

The bone is surgically separated, and the frame extends when the device’s struts are lengthened which is done several times each day. The lengthening process usually begins about five to seven days after surgery. The fixator remains on the limb throughout the entire process, which can take up to a year or more.

**External Fixation Risks**

- Pin tract infections and possible pin breakages.
- Nerve or vascular damage following insertion of wires/pins.
- Soft tissue tethering around wires or pins.
- Bone weakening while in fixator.
- Permanent loss of range of motion in the nearby joints.
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Surgical Treatment

Internal Fixation

New technology makes it possible to lengthen bones with a telescopic device inside the bone’s marrow cavity. The internal device interacts with an External Remote Controller to lengthen the limb about 1 mm per day, approximately 1 inch per month. The device is usually removed after 12 to 18 months.

The customizable programming of the External Remote Controller allows for lengthening sessions to be performed at the patient’s home. This allows for a precision-controlled process with the ability to customize treatment in a non-invasive manner.

Internal Fixation Risks

• Infections may occur.
• Device may lose length or fail to lengthen.
• Possibility of device breakage.
• Loss of range of motion in the joint, caused by failure to follow the prescribed physical therapy regimen.
Surgical and Nonsurgical Requirements

Shoe Lift
• Purchase of inserts or custom-made lifts for every pair of shoes.

Growth Arrest
• Regular follow-up visits to the surgeon’s office.
• Hardware removal.

Bone Shortening
• Regular follow-up visits to the surgeon’s office.
• Extensive physical therapy, as prescribed by the surgeon.

External Fixation
• Regular follow-up visits to the surgeon’s office.
• Frequent cleaning of the area around the wires and pins.
• Adjustment of the frame several times a day.
• Extensive physical therapy, as prescribed by the surgeon.
• Hardware removal.

Internal Fixation
• Regular follow-up visits to the surgeon’s office.
• Three to four sessions (about seven minutes total) to reach a maximum of 1 mm per day, using the External Remote Controller, following surgeon’s prescription.
• Extensive physical therapy, as prescribed by the surgeon.
• Hardware removal.

These are general surgical and nonsurgical requirements and are not exhaustive for each option. A surgeon experienced in limb lengthening techniques can explain the treatment options, risks, and benefits in more detail. Only you and your surgeon can decide what treatment, if any, is best for you.
References


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