

# Ask the Physical Therapist

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## What are contractures?

Contractures are the permanent or semi-permanent restriction of movement of soft tissues due to shortening and/or structural changes in the connective tissues of the body. Sometimes the normally elastic or stretchy tissues are replaced by stiff, fibrous tissue; this can be in skin, muscles, tendons and ligaments. When these soft tissues surrounding the joints in the body become shortened or inelastic, a joint contracture develops that can severely limit the motion of the joint or even freeze it in one position. This occurs for a variety of reasons. Nerve damage or neurologic disease paralyzes muscles; injuries or burns will cause inelastic scar tissue; and immobilization for prolonged periods such as casting after fracture or surgery will allow structural changes and shortening to take place. Often, just inactivity due to illness or to pain in joints will reduce the range of joint motion through the changes noted above.



## Why are contractures a problem for amputees?

Contractures can so severely limit joint motion that general mobility and function are affected. When joint motion is restricted, the limbs or residual limbs of an amputee cannot move through the motion they need for function and regular activity. If a below-knee (BK) amputee has a knee flexion contracture, fitting of a prosthesis is difficult. If a prosthesis can be fitted, standing on it with the knee bent requires much greater muscle power and causes much quicker fatigue than standing with the legs straight. Anyone can experience this by trying to stand for 5 minutes while keeping the knees bent.

The same is true for an above-knee (AK) amputee with a hip flexion contracture. A hip flexed beyond 15 degrees makes fitting a prosthesis difficult. If a prosthesis can be fitted, standing with a normally straight spine becomes impossible and even more fatiguing because the hip muscles also attach to the spine. Many AK amputees with hip flexion contractures will likely always need a walker so they can relieve some of the strain from their flexed backs by putting weight on their hands.

Now let's talk about actually making some steps. When the BK amputee with a knee contracture attempts to step with the prosthesis, he or she cannot swing his lower leg out in front of him or her, forcing a shorter step and a much more inefficient gait. Most amputees will already make a shorter step with the intact limb (if they have one). This forces the amputee to try to make steps by twisting the trunk to step out farther, exacerbating what is probably already a sore and tired back. The AK amputee with a hip contracture will not be able to use the prosthetic limb to propel himself or herself forward because he or she cannot push the hip back.

Watch people walk, or look at a picture of people in motion and you can see how the hip normally extends out behind them. When the hip is limited to a flexed forward position, the natural rhythmic left-right propulsion of stepping is lost. A study from the University of Pittsburgh showed that when all factors were considered, the absence of joint flexion contractures was the most important predictor of successful early prosthetic use.

Upper-extremity amputees will have a difficult time reaching forward to grasp or hold objects if they cannot extend the elbow or reach up with the shoulder. Normal activities that require both hands cannot be performed. This can affect dressing, cooking, grooming or eating.

## What can amputees do to prevent contractures?

Prevention is certainly the best approach to dealing with contractures because they are extremely difficult to stretch out once they develop. Unfortunately, most amputees have spent a lot of time trying to salvage a limb or confined to bed with multiple medical problems before the amputation surgery itself. Limited time spent up and normally moving about is the likely cause of most contractures. Lying in a hospital bed with the head of the bed up and the knees bent up or pillows under the knees is a sure way to induce contractures at the hips and knees. Similarly, lying in bed with the elbow bent up on the chest most of the time will result in a contracture at the elbow.

Some studies have indicated that at least 5 to 6 hours of activity per day is required to maintain normal joint motion, regardless of time spent stretching every day. Stretching can certainly help, but activity and exercise are even more important for maintaining joint range of motion, especially when someone is limited to bed activity or wheelchair activity. A physical or occupational therapist can be very creative in developing an exercise and activity program in such a restricted setting.

## How can amputees manage or get rid of contractures once they have them?

Stretching out contractures can be very difficult to impossible. How tissues elongate and what mechanisms can facilitate this are not well-understood. Therapists can manually stretch contracted joints, amputees can self-stretch and static splints and spring-loaded dynamic splints have been used. Even a process called serial casting has been used to stretch out contracted joints. A series of casts is applied to the contracted joint (serial casting), each one stretching out the joint more than the last one over time. This works much more easily with distal joints such as ankles, knees, wrists and elbows, but not so easily for hips and shoulders. The process is lengthy, uncomfortable and even more restrictive, as the cast itself is heavy and bulky. Other techniques use heat with stretching. One study showed that ultrasound treatment added to prolonged stretching worked better than prolonged stretching by itself.

It takes lots of time and hard work to stretch out a contracted joint, and stretching alone won't get it done. It is very important that active exercises are used along with stretching for more sustained rather than temporary increases in joint range of motion. Consult a physical therapist for appropriate exercises, activities, and a stretching regimen to improve joint movement.

## Are orthotic devices useful?

Orthoses and static and dynamic splints can help limit contractures at the ankles, knees or elbows when a person is confined to a bed or chair for a long time. A common contracture at the ankle is the "foot-drop" position, and this can be avoided with night splints. These



devices can also help stretch out already contracted joints, but the emphasis is on "help stretch," since it takes active exercise in addition to splints or orthoses to increase the motion in a restricted joint. In fact, some research shows that exercise alone is more important than the prolonged stretching provided by a dynamic splint in stretching a contracture.

The most important point in any discussion of contractures is that prevention works best. However, if a contracture does develop, there are many approaches to treatment. The best results are usually obtained through a combination of approaches, but one of the most important elements is an active exercise program. ■