

# Contractures

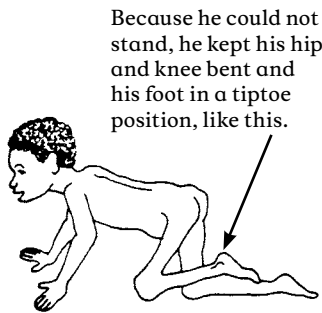
## CHAPTER 8

### Limbs That No Longer Straighten

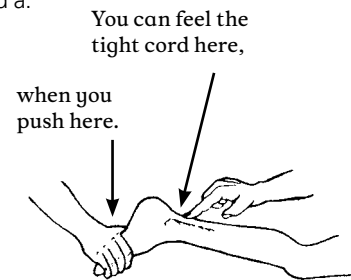
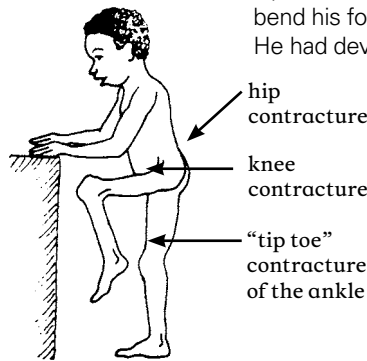
#### WHAT ARE CONTRACTURES?

When an arm or leg is in a bent position for a long time, some of the muscles become shorter, so that the limb cannot fully straighten. Or shortened muscles may hold a joint straight, so it cannot bend. We say the joint has a contracture. Contractures can develop in any joint of the body. For example:

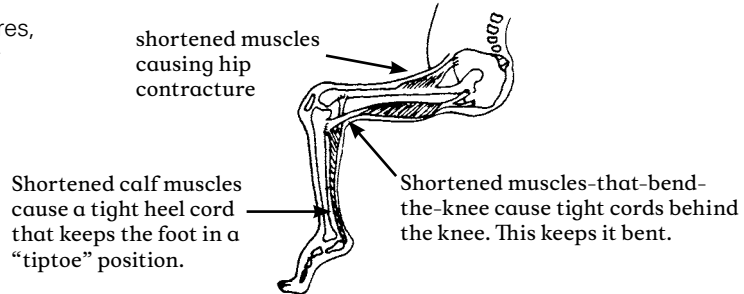
1. Miguel spent the first years of his life crawling because one leg was paralyzed.



2. In time, he could not straighten his hip or knee, or bend his foot up. He had developed a:

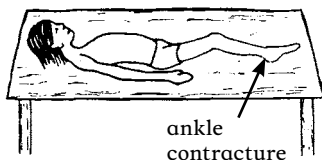


3. Because of the contractures, Miguel could not stand or walk, even with a brace.



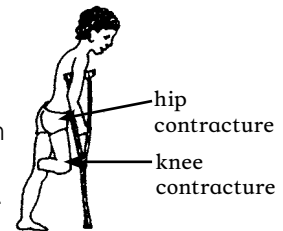
Contractures develop whenever a limb or joint is not moved regularly through its full range of motion. This is likely when:

- a very weak or sick child is in bed for a long time.

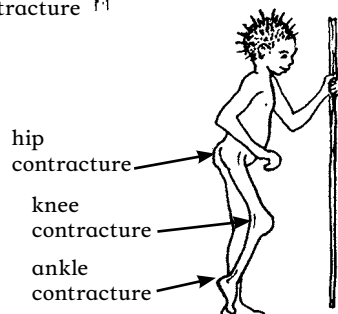


- a child is badly burned and the burned skin scars, or sticks together, around joints (see Chapter 28).

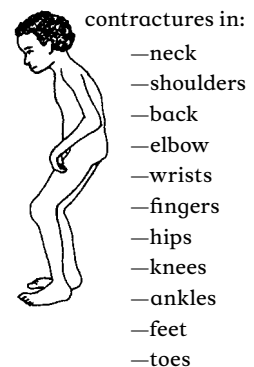
- a child with an amputation keeps joints bent.



- a paralyzed limb is kept bent or hanging.

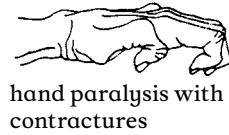


- a child has joint pain that prevents her from straightening her joints.



## Why is it important to know about contractures?

- Most contractures can be prevented through exercise and other measures. Yet in many communities, at least half of the children with physical disabilities already have contractures.
- Contractures make rehabilitation more difficult. Often they must be corrected before a child can walk or care for himself.
- Correction of contractures is slow, costly, and often very uncomfortable or painful.
- It is best not to let contractures develop, and if they do begin to develop, to correct them as soon as possible. Early contractures often can be easily corrected at home, with exercises and positioning. Advanced, old contractures are much more difficult to correct, and may require gradual stretching with plaster casts, or surgery.



For all these reasons . . .

**The family of every child with disabilities should understand how contractures develop, how to prevent them, and how to recognize and correct them when they first begin.**

## Muscle imbalance—a major cause of contractures

When the muscles that bend or pull a limb in one direction are much stronger than those that pull it in the opposite direction, we say there is a muscle imbalance. When paralysis, painful joints, or spasticity (see p. 89) cause a muscle imbalance, contractures are much more likely to develop.

CP

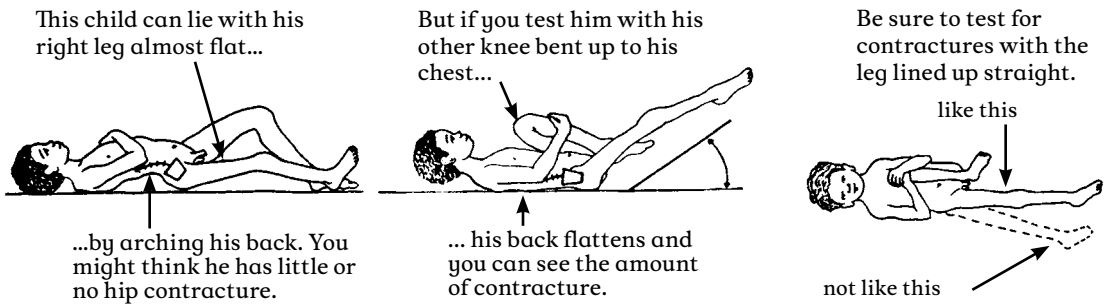
CP

<p><b>WITHOUT MUSCLE IMBALANCE—CONTRACTURES LESS LIKELY</b></p> <p>A leg that is completely paralyzed is not very likely to develop contractures. The knee may even straighten more than is typical.</p> <p style="text-align: center;">muscles equally weak on both sides</p> <p style="text-align: center;">no contracture</p>	<p><b>WITH MUSCLE IMBALANCE—CONTRACTURES MORE LIKELY</b></p> <p>If the muscles that straighten the knee and lift the foot are very weak, and the muscles that bend the knee and lower the foot are strong, contractures are very likely to develop.</p> <p>Muscle imbalance causing contractures can result from spasms, or spasticity, that increase the pull of certain muscles (cerebral palsy and spinal cord injury).</p> <p>For example, the bent elbow and crossed legs of this child with spastic cerebral palsy can lead to contractures so that his legs cannot be spread apart or his elbow straightened.</p> <p style="text-align: center;">“knock-knee” contracture of hips</p>
--	--

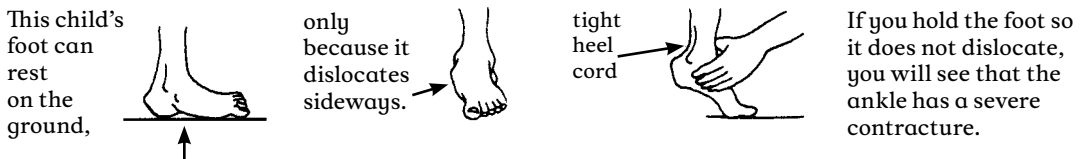
To check for muscle imbalance, test and compare the strength of the muscles that bend a joint, and of the muscles that straighten it (see muscle testing, p. 30).

## EXAMINING THE CHILD FOR CONTRACTURES

This is done through testing the range of motion of different joints, as described on pp. 27 to 29. Most contractures will be obvious when you test for them. But hip contractures can easily be missed.



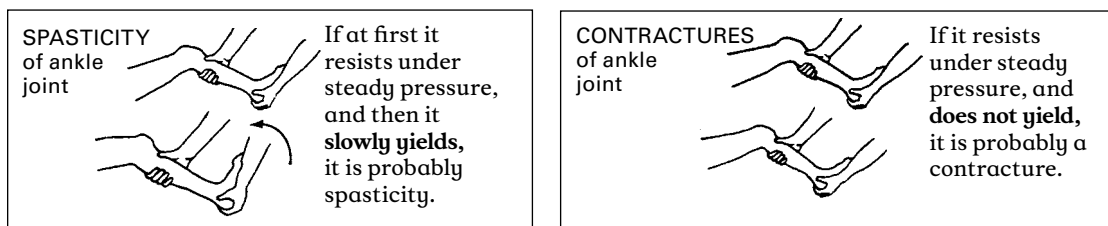
Also **be sure joints do not dislocate** when you test for contractures, because this can fool you, too. For example:



## How to tell contractures from spasticity

**Spasticity** (muscle tightening that the child does not control) is common when there is injury to the brain or spinal cord (see p. 89). It is sometimes mistaken for contractures. It is important to know the difference.

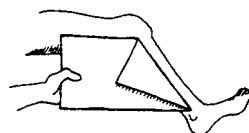
CP



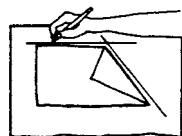
Spasticity often leads to contractures. For details, see pp. 102 and 103.

## MEASURING CONTRACTURES

This can be done by folding a paper and measuring the angle, as shown here,



and then tracing that angle onto a record sheet.



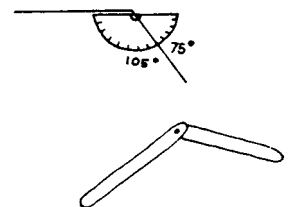
You can record your measurements with stick figures.



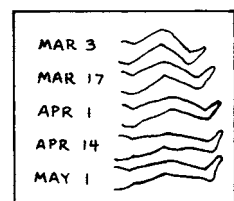
Or an easier, more fun way is to use a flexikin (see p. 43).

Or use a protractor.

Or make a simple instrument of 2 thin pieces of wood joined by a bolt or rivet, tight enough so that they move stiffly.



By keeping a record of their child's progress, a family can see the results and is more likely to keep working hard at exercises to correct a child's contractures.



## Can a contracture be straightened in the village?

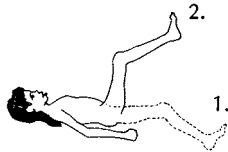
Contractures usually begin with shortening of muscles, causing tight cords (tendons). Later, the nerves, skin, and joint capsule also can become tight. (A “joint capsule” is the tough covering around a joint.)

When a contracture is only in the muscles and cords, it can usually be straightened by exercises and casts at a village rehab center, although sometimes this may take months. But if the contracture also involves the joint capsule, it is often much more difficult or impossible to correct, even with many months of using casts. Surgery may be needed.

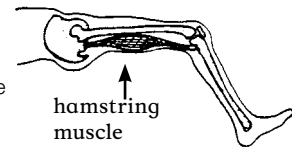
**Note:** If you find the information on this page hard to understand, do not worry. Come back to it later, when you meet very stubborn contractures.

### TO TEST THE KNEE JOINT:


Check the range of motion of the knee with the hip straight and then bent.



**Explanation:** One of the main muscles that causes a knee contracture is the hamstring muscle, which runs all the way from the hip bone to the bone of the lower leg. This means that when the hip is bent, the tight muscles will bend the knee more.

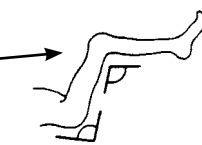


If the knee straightens more when the hip is straight



hip straight

than when the hip is bent,




hip bent

probably this is a **muscle contracture** (a short hamstring muscle).

**THE KNEE BENDS MORE: MUSCLE CONTRACTURE**


This can often be corrected in the village.

But if the knee straightens equally when the hip is straight or bent,



probably there is contracture of the **joint capsule**.

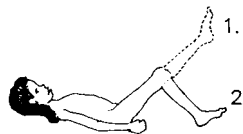
This often requires surgery.



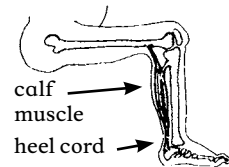
**THE KNEE BENDS THE SAME: JOINT CAPSULE CONTRACTURE**

### TO TEST THE ANKLE JOINT:

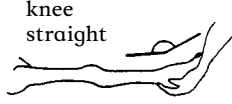
Check the range of motion of the ankle with the knee straight and then bent.



**Explanation:** One of the main muscles that pulls the foot to a tiptoe position runs from the thigh bone all the way to the heel. This causes the heel cord to pull more when the knee is straight than when the knee is bent.




If the foot pushes down more when the knee is straight



knee straight

than when the knee is bent, it is a **muscle contracture**.

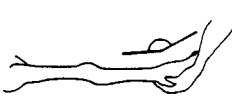


knee bent

This can often be corrected in the village.


**THE FOOT BENDS UP MORE: MUSCLE CONTRACTURE**

But if the foot angle is the same when the knee is straight or bent,



there probably is a contracture of the **joint capsule**.

This often requires surgery.



**THE FOOT BENDS THE SAME: JOINT CAPSULE CONTRACTURE**

## JOINTS THAT DO NOT MOVE AT ALL

If a joint moves only a little, the joint capsule may be very tight, or there may be a deformity in the bones. With exercises, try to gradually increase the movement.

If a joint does not move at all, the bones may be fused (joined together). This often happens when there is a lot of pain and damage in the joint. When a joint has fused, exercise will usually not bring back motion. The only surgery that might help return joint motion is to put in an artificial joint of metal or plastic. This surgery is very costly, and if the person is very active, the joint may not last more than a few years.

# PREVENTION AND EARLY MANAGEMENT OF CONTRACTURES


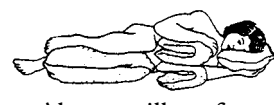

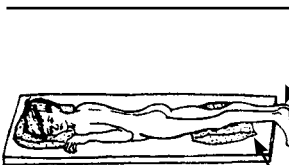
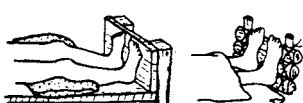
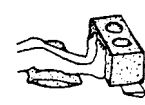

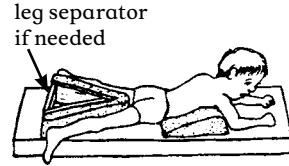
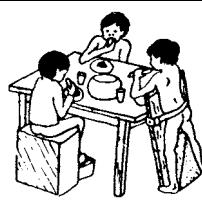
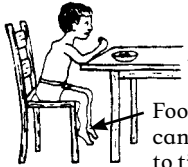
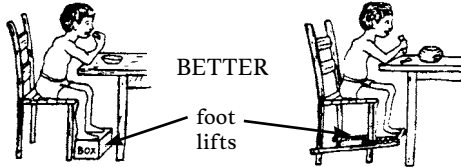



Contractures can often be prevented by (1) positioning, and (2) range-of-motion exercises.

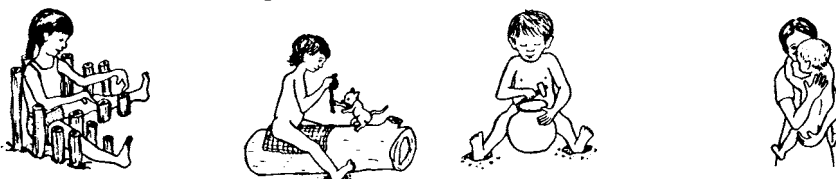
## POSITIONING

If a child is likely to develop contractures or has begun to develop them, try to position her to stretch the affected joints. Look for ways to do this during day-to-day activities: lying, sitting, being carried, playing, studying, bathing, and moving about.

During a severe illness (such as acute polio), or a recent spinal cord injury, contractures can develop quickly. Therefore, early preventive positioning is very important:

<p><b>CORRECT</b></p>  <p>Put a pillow between legs to hold knees apart.</p> <p>Lying and sleeping straight helps prevent contractures.</p>	<p><b>CORRECT</b></p>  <p>Also use pillows for side-lying to keep a good position.</p>	<p><b>WRONG</b></p>  <p>Do not lie or sleep with legs in a twisted or bent position. This causes contractures.</p>
 <p>Letting feet hang over edge helps prevent ankle contractures.</p> <p>Lying part of the time face down helps stretch hips backward.</p> <p>A pillow here helps stretch knees.</p>	 <p>A foot board helps to prevent ankle contractures.</p>	 <p>The foot support can be leaned forward a little so that the child can stretch his feet by pushing against it. (Be sure to pad it.)</p>
 <p>Support feet at right angles.</p> <p>If knee contractures might develop, keep the knees straight as much as possible.</p>	 <p>leg separator if needed</p> <p>A child who spends most of the time sitting should spend part of the day lying or standing (on a frame if necessary). This will help prevent contractures of the hips and knees.</p>	
 <p><b>WRONG</b></p> <p>Foot hanging can lead to tiptoe contractures.</p>	 <p><b>BETTER</b></p> <p>foot lifts</p>	 <p><b>BEST</b></p> <p>child-sized furniture</p>

For a child with spasticity whose legs press together or cross, look for ways to sit, lie, or carry him with his legs separated. Here are a few examples.

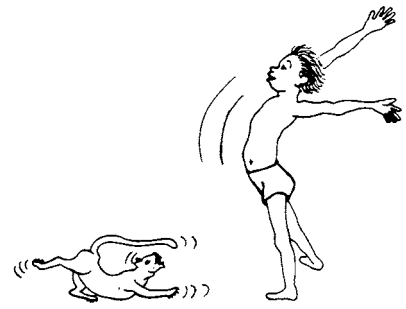


For more examples of ways to prevent "knock-knee" contractures, see p. 101.

For more ideas about special seating and positioning, see Chapter 65.

## Exercises to prevent contractures

Just as cats, dogs, and many other animals stretch their bodies after they wake up, children often enjoy stretching their limbs and testing their strength. The most effective way to get children to move their limbs is encouraging them to play and allowing them to do as much as they can for themselves.



**Daily stretching keeps the joints able to move smoothly and freely through their full range of motion.**

Unfortunately, some children, because of illness, paralysis or weakness, are not able to stretch all parts of their bodies easily during their play and daily activities. If some part of their body is not regularly stretched or moved through its full range, contractures may develop.

To maintain full, easy movement of their joints and limbs, these children therefore need daily exercises that move the affected parts of their bodies through their full range of motion.



Range-of-motion exercises for the shoulder.

Range-of-motion exercises for each body joint are discussed in Chapter 42.

As much as possible, the child herself should try to move the affected part through its range of motion. Often the limb will be too weak and help is needed. But be sure the child moves it as much as she can herself.



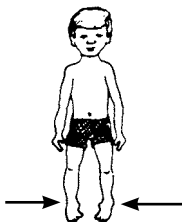
BEND YOUR FOOT UP AS FAR AS YOU CAN. I'LL HELP YOU.

**Have the child move the part as far as she can without help. Then help her to move it the rest of the way.**

Where there is muscle imbalance, strengthening the weaker muscles can help prevent contractures. Examples of muscle strengthening exercises are on pp. 138 to 143 and pp. 388 to 392.

As much as possible, try to make exercises fun.

A child whose feet tend to bend inward like this,



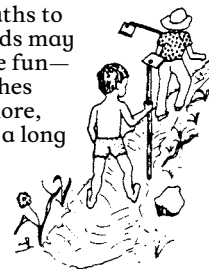
may benefit from exercises that bend them outward, like this.



Walking on boards in a V-shape may provide similar stretching and be more fun.

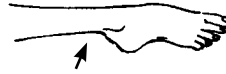


But going with father on the V-shaped paths to the bean fields may be even more fun—and it stretches his ankles more, because it is a long way.



**FOUR WAYS TO APPROACH STRETCHING EXERCISES:** To prevent (or help correct) contractures, exercises can be done in 4 different ways, depending on the needs and ability of the child. These 4 ways, shown on the next page, progress from exercises where the child depends completely on help, to exercises that she does on her own as a part of everyday activity.

**FOUR WAYS TO DO EXERCISES THAT STRETCH A TIGHT HEEL CORD**



**1. Someone else moves the limb.**



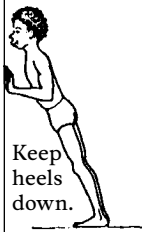
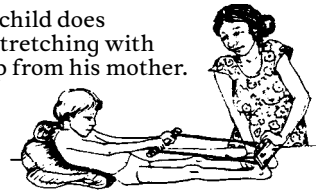
Often necessary—but not much fun.

**2. The child does his own exercises, but without using the muscles in the affected part.**



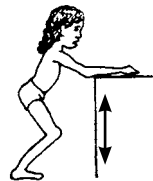
(This may help to prevent a contracture but will not help much to correct it.)

Here the child does his own stretching with some help from his mother.



Keep heels down.

Leaning against a wall stretches the feet more than standing upright does.



If the child is strong enough, bending the knees or touching the toes is a good way to stretch the muscles that cause a tight heel cord.



CAUTION: When doing these exercises, carefully check to see that the foot is not dislocating to the side.

If so, you should use Method 1, being careful to hold the foot in such a way that it does not "cave in" to the side.



**3. The child does the exercise—using muscles of the affected part.**

**WITH ASSISTANCE:**

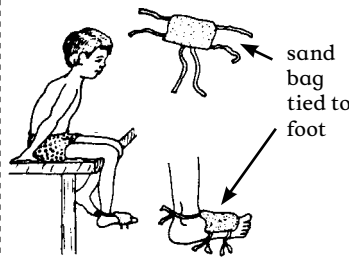
If the child has some strength to raise his foot, have him raise it as far as he can. Then help him to raise it as far as it will stretch.

Developing the muscles that lift the foot may help prevent contracture.

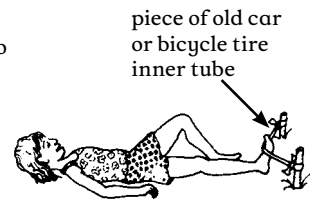


**AGAINST RESISTANCE:**

If the child has enough strength to raise his foot against resistance, he should do so. But be sure that the foot comes **all the way up**.



sand bag tied to foot



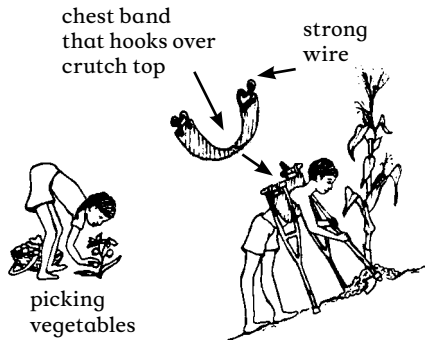
piece of old car or bicycle tire inner tube

**4. The child does the exercise—during normal daily activities.**

Figure out ways or aids so that the child can take part in ordinary activities that stretch muscles and prevent contractures.



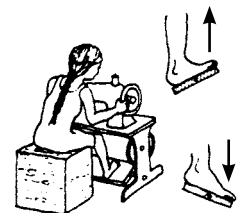
standing and walking uphill to stretch heel cords



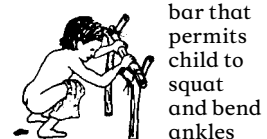
chest band that hooks over crutch top

strong wire

picking vegetables



Sewing on a machine can exercise foot and combat contractures.



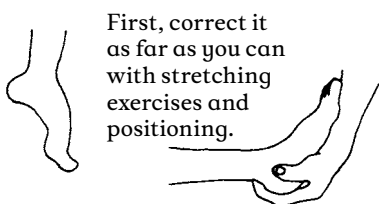
bar that permits child to squat and bend ankles

## DIFFERENT METHODS TO CORRECT CONTRACTURES

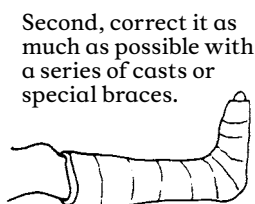
- When contractures are just beginning to develop, stretching exercises and simple positioning may be all that is needed to correct them.
- When contractures are more advanced, stretching must be done steadily over a long time, using fixed positions, casts, braces, or special equipment that keep a continuous pull on the affected joints.
- When contractures are old and severe, correction by surgery may be needed.

Even when contractures are advanced, it is usually best to try to correct them as much as possible using simpler, less harsh methods first.

### If a contracture is advanced:

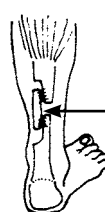


First, correct it as far as you can with stretching exercises and positioning.



Second, correct it as much as possible with a series of casts or special braces.

Third, if more correction is still needed, consider surgery.



Surgery often consists of lengthening the tight cords.

Instructions for correcting contractures using plaster casts or braces are in Chapter 59.

**CAUTION:** Some orthopedic surgeons are quick to recommend surgery. However, we have found that many contractures often said to need surgery can be corrected in the village or home by exercise and casting or braces. In any case, stretching exercises and bracing are often needed for a long time after surgery (or forever) to prevent the contractures from coming back.

Also, some contractures are best left uncorrected (see Chapters 42 and 56). When in doubt, consult an experienced rehabilitation therapist.

## Exercises to correct contractures—stretching exercises

These are similar to the range-of-motion exercises used to prevent contractures, except that steady, gentle but firm stretching is required:



1. Hold the limb in a steady, stretched position while you count slowly to 25.
2. Then gradually stretch the joint a little more, and again count slowly to 25.
3. Continue increasing the stretch in this way, steadily for 5 or 10 minutes. Repeat several times a day.

**CAUTION:** To avoid damaging the limb, hold it near the joint, as shown. It is acceptable if the stretching hurts the child a little, but it should not hurt him a lot. If you want faster results, do not apply more force. Stretch the limb for longer and more times each day.

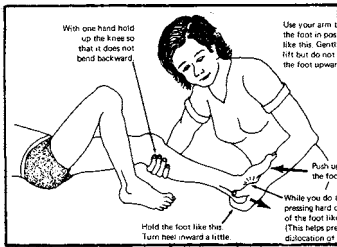
In children who do not have feeling in their legs, take care not to stretch forcefully. You could cause injuries.



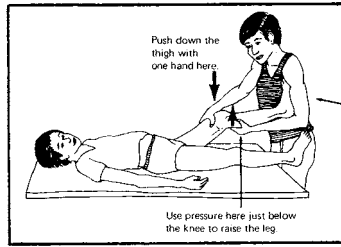
**STRETCHING EXERCISE INSTRUCTION SHEETS**

Some stretching exercises are done best using specific techniques. Often they need to be done at home for weeks or months. You will find instruction sheets for the most frequently needed stretching exercises in Chapter 42, "Range-of-motion and Other Exercises." They include:

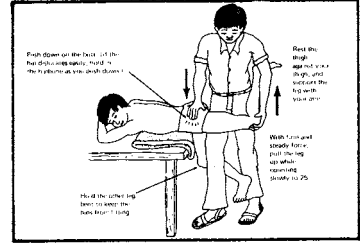
**Stretching exercise for a tight heel cord. See p. 383.**



**Stretching exercise for a bent knee. See p. 384.**



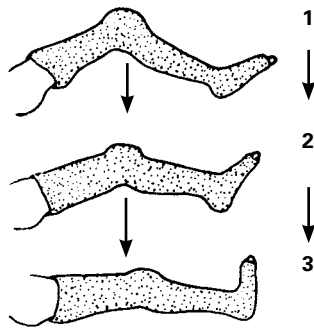
**Stretching exercise for a bent hip. See p. 385.**



**HOLDING A CONTRACTED JOINT IN A STRETCHED POSITION FOR LONG PERIODS**

**Chapter 59** discusses the use of casts, braces, and other aids to stretch difficult contractures. These include:

**a series of plaster casts and wedges**



**Advantages:**

Holds leg in exactly the position you want it.

Child (or parents) cannot easily remove it.

Especially useful for difficult deformities that bend in different directions.

**Disadvantages:**

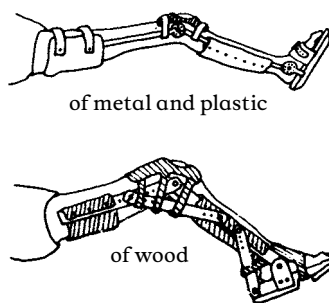
Cannot be easily removed to check for sores, to bathe, and to exercise. (Therefore, casts should usually not be used on children with arthritis or children without feeling in their legs.)

Hot in warm weather.

Expensive (plaster bandage).

Adjustments require trip to clinic or rehabilitation center.

**adjustable braces**



**Advantages:**

Can be adjusted by family at home.

Can be easily removed to check for sores, for bathing, and exercise.

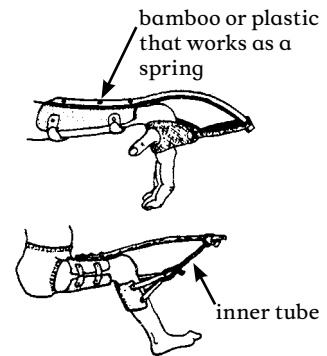
**Disadvantages:**

More difficult to make and to fit well.

Difficult to use on child with various deformities that go in different directions.

Child (or parents) may remove and not use it.

**elastic stretching devices**



**Advantages:**

Same as for adjustable braces, and also:

Does not need frequent adjustment because it keeps pulling as joint stretches.

**Disadvantages:**

Clumsy—gets in the way.


Difficult to make so they work well.

Often not good with spasticity.


## HIP CONTRACTURES

Hip flexion contractures (in which the thighs stay bent forward at the hips) are often difficult to straighten and require specific techniques.

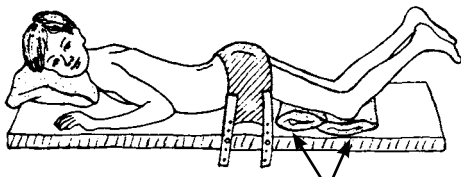
Advanced hip contractures like this often require **surgery**.



Less advanced hip contractures like this can sometimes be straightened using **positioning and straps**.



The child lies face down with a wide strap pulling his butt down.



cushion under thighs  
(Avoid pressure on knees.)

The child should spend as many hours as possible each day in this position. And if possible, also at night. Knees should be checked for early signs of pressure sores every hour or so (see Chapter 24).

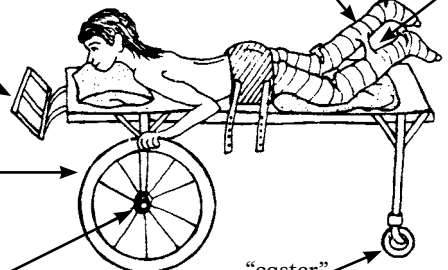
Life can be made more interesting for the child during the weeks or months of stretching by using a lying frame on which she can move about.

A rack or bookholder so she can play or read.

large bicycle wheels

extra strong axles and hubs (see p. 623).

casts to straighten knees and ankles



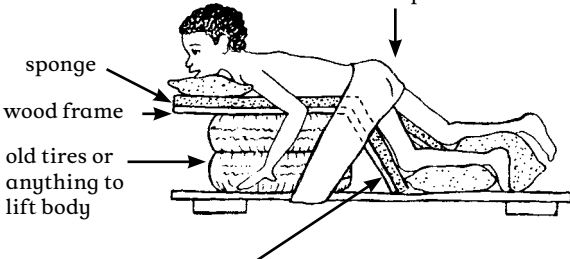
“caster” rear wheels, for turns

A bar fastened between the 2 leg casts helps keep them in a stable position (and also helps prevent contractures that pull the legs together).

For other designs see p. 618.

**CAUTION:** When stretching contractures this way, be careful to prevent pressure sores (bed sores), especially on the knees. If the child complains a lot, loosen the strap a little. For eating, bathing, toilet, and exercise she can be unfastened and moved into convenient positions. But it is best that she remain strapped down about 20 out of each 24 hours.

The child with more severe contractures at the hips may need to be strapped on an angled frame.

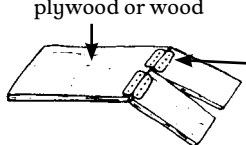


sponge

wood frame

old tires or anything to lift body

strap



plywood or wood

Leather or canvas strips work as hinges that support legs.

The angle of the leg boards is set to give gentle but continuous pressure against the thighs. As the contracture is gradually corrected, the angle is changed by raising the leg boards or by lowering the body board.

For children with different angles of contracture in each hip, the 2 leg boards can be adjusted differently.

For additional information on contractures relating to different disabilities, aids, and equipment, see the INDEX under “Contractures.” For methods to correct contractures, see Chapter 59.