# Corns and Calluses:
# Why do I get them? What can be done about them?

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## Introduction

The underlying reason we get corns and calluses on our feet is the same in every case -- there is an increase in pressure or shearing forces experienced by the skin. Most of the time, this is a result of an increase in pressure between the skin and the force of the ground, pressure of nearby bony prominences, or pressure from the shoes we wear. Looking at the reasons we get corns and calluses is the first step in understanding what we can do to prevent their occurrence, or provide relief when they develop.

## What are Calluses?

Foot calluses are usually described as a buildup of skin that occurs on the bottoms of our feet; these are comparable to the calluses we get on the palms of our hands from excessive work. This buildup is an abundance of the outermost layer of our skin, known as the stratum corneum. This is also known as keratinized tissue, which is the origin of the term hyperkeratosis, the clinical term for excessive buildup of this skin layer. Corns, on the other hand, are generally used to describe buildup of skin on the tops or sides of toes.

## What Causes Calluses?

Why does this tissue layer build up in only certain locations? On the simplest level, skin is capable of doing only two things: growing or breaking down. Our skin is constantly regenerating itself, and the regeneration of new skin and sloughing of old skin cells is a perpetual process over the entire body. What is unique in corn and callus formation is that the outer layer of skin is growing at a much more rapid rate than the skin around it. The reason for this, again, is that there is increased pressure in those areas. Consider the calluses we get on our hands from repetitive activities like shoveling or lifting weights. These are the result of repeated pressures in specific locations over time. A callus is the body's way of laying down a stronger, thicker layer of skin in a location that is subjected to a more demanding share of the workload. These calluses are different than the blisters we get the same day we "surprise" our bodies unusual amounts of repetitive skin pressure or shear over a short time. A blister is the result of skin tissue breakdown before a protective callus has had time to be produced. Consider the lumberjack chopping wood; he may have had blisters his first week on the job, but the tough-as-leather hands he has now are the result of his body adjusting to the stress by laying down callus tissue.

The corns and calluses we get on our feet form for exactly the same reason: increased skin pressure and stress in specific locations. The skin is again faced with its only two choices: build up or break down. Ironically, the buildup of skin intended to protect is is actually the source of our discomfort. Each step can be a painful reminder that our skin is doing a great job of growing. It will continue to grow faster in those areas that pressures remain highest, unless we do something about it. Before discussing treatment options, it is helpful to have a good working knowledge of some of the factors that cause the increase in pressure that results in corn and callus formation.

## The Mechanics Involved

Calluses that form on the bottom of feet often occur on the ball of the foot, an area formed by the ends of the five long bones connecting to our toes. These bones, the metatarsals, are similar in

structure to the analogous bones in our hands, the metacarpals. Make a fist: the bumps that form the big knuckles at the end of our hands are the metacarpal heads. Metatarsals, in our feet, also have these nearly round heads, and play a big role in bearing the weight of our bodies when we stand or walk. Sometimes one of these metatarsal bones is unusually long, or sits lower than the ones next to it. The result is that a given metatarsal head bears a disproportionate amount of the load. It is hitting the ground first and hardest, is bearing more weight, and doing it for a longer period of time than the other metatarsals. The result? There is a dramatic increase in the pressure applied in that particular area. Again, the skin has two choices, and when able to do so, it will always choose to grow. The callus forms to protect the skin from the breakdown that will occur if this reinforcement is not attempted. Once the callus forms however, we begin to feel the discomfort. Indeed, the callus is there for all the right reasons, but its very presence increases the amount of pressure in that area, which causes pain.

The pain caused by corns and calluses is a blessing: it is a signal from the body to take action. This action is either to remove the callus or remove the pressure from the area causing it. Both options work well, and the choice of which approach to employ is as individualized as each person and the specific reasons their corns and calluses formed. Among many other reasons, plantar (bottom of the foot) calluses can develop because of an area of scar tissue, previous fracture, the presence of a wart, a plugged sweat gland, different types of arthritis, or contractures of the toes (termed hammertoes, or mallet toes). Hammertoes are of particular interest, as they are implicated in both calluses under metatarsal heads and corns on and between the toes themselves.

Formation of hammertoes is usually due to a muscular imbalance within the foot. A contracted toe, flexed at the first or second knuckle, causes a rising of the toe, and a simultaneous lowering of the metatarsal head behind the toe. The result can be a callus under the metatarsal head, and a corn over the flexed knuckle from increased shoe pressure. A callus can also form at the tip of the toe, if the toe is bent in such a way that the tip, rather than the pulpy bottom of the toe, is absorbing the weight of standing and walking. Corns can also form between toes due to the bony prominences of two adjacent toes rubbing together. The reasons for corn formation are the same as any other hyperkeratosis; here the reasons are usually shoe pressure or shear, or adjacent toe pressure, rather than the force of the ground. The pain that results is a call to action. Unfortunately, not everyone is equipped with this signaling system.

Some people do not have the benefit of good sensation in their feet, like many people living with diabetes. As a result, they may not even be aware of potentially harmful pressures to their feet. For these people, the very presence of calluses requires attention. Without the pain signals, a callus left untreated could lead to skin breakdown, or ulceration, which can ultimately be limb-threatening. All people with diabetes or diminished sensation in their feet should be regularly examined by their podiatrist. This physician specializes in the diagnosis and treatment of conditions of the foot. The podiatrist can inform these patients more about their condition, and provide effective treatment that can assist the patient in avoiding harmful complications.

## Treatment Options

The treatment of calluses and corns falls into two main categories: conservative and surgical. Within the conservative category is prevention. Prevention of corn and callus formation, for many people, is as easy as selecting shoes that fit properly. Selecting a shoe with an accommodative or cushioned insole may provide significant relief for the person with a tendency to form calluses on the ball of their foot. Other shoes have more instep and arch support, which can help share the load placed on the ball of the foot. A shoe with a wider toe box (more space for the toes) is often helpful for those whose toes are painfully cramped in other shoes, causing discomfort on top or between the toes. Still others will prefer a shoe with extra depth for the toes, to allow for the relative increase in the height of a toe in the shoe caused by a hammertoe deformity. Discussing your specific needs with knowledgeable shoe retailers is important in finding the shoe appropriate for one's unique requirements.

Other conservative measures include padding, which can be found both over the counter in drug stores, or provided by your podiatrist. Care should be taken when selecting pads advertised as being "medicated;" this usually means that there is an acid additive to the pad itself, to dissolve the hyperkeratosis (callus tissue). Remember that acid will work on whatever skin it comes in contact with, so if a pad shifts in the shoe, the acid may be working on healthy skin instead of the corn or callused tissue. This can be a potential drawback, and are therefore not recommended for patients with decreased sensation in their feet.

Padding or inserts can also be made to pad around the painful callus, instead of directly over it. This idea of offloading the pressure area is designed to eliminate or at least slow the formation of a corn or callus. It is important to note that all over the counter inserts are designed to work for as many people as possible; they are not custom-made to any specific person. Custom orthotic inserts can be designed and prescribed by a podiatrist to meet one's specific needs.

Trimming of corns and calluses is another conservative service provided by the podiatrist, often in conjunction with shoegear recommendations or modifications, and padding. Corns and calluses can be trimmed using sterile surgical blades, often with little or no discomfort or bleeding. The corn or callus will return, however, if nothing is done to accommodate for or correct the reason they formed in the first place. For many people, occasional debridement (trimming) of calluses, adjustments of shoegear, and inserts or padding are extremely successful. For non-diabetics with good sensation in their feet, daily maintenance with mild abrasives like pumice stones can be effective for troublesome area. This quick treatment each day after bathing can keep a callus from becoming uncomfortably large. Again, diabetics are discouraged from self-treating unless it is recommended by their podiatrist; even conservative home-treatment of the foot with poor sensation or circulation can be disastrous.

## Surgical Treatment

If conservative measures fail, there are surgical options available. The procedures vary greatly, depending on the reasons for the corn or callus formation. If a hammertoe is responsible, the podiatrist can perform surgery to straighten the toe. Surgical cuts can be made to raise the position of a too-low or too-long metatarsal. Other metatarsal procedures include preventing a metatarsal from moving too easily. A metatarsal that rises too easily under weight bearing pressure can subject the more sturdy neighboring metatarsals to an unfair amount of the load -- this uneven distribution of pressure can lead to calluses. Whether due to too much or too little motion, the podiatrist can perform a surgery to correct for an improperly positioned metatarsal. Sometimes wires, pins, or screws are used to maintain the position of a bone after it is surgically cut. Depending on which procedures are selected, the patient may need a stiff-soled surgical shoe or possibly a cast and crutches for several weeks after the surgery. Each procedure is different, and has its own limitations and post-operative care requirements. In every case, surgical intervention is entertained only after conservative methods have been unsuccessful in providing relief. Your doctor can explain which, if any, surgical procedures are recommended for your unique condition.

## Conclusion

In summary, corns and calluses are an extremely common condition that can usually be conservatively treated. Selecting appropriate shoes, understanding the unique reasons for your callus, and seeking professional evaluation and treatment are all part of finding relief. Diabetic patients especially should be evaluated by a podiatrist at least twice per year, so that any developing foot conditions may be identified and treated before they can become problems. Surgical options are available for corns and calluses that do not respond to conservative care, and these can be further explained and performed by your podiatrist.

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