

Side Effects of Corticosteroids

According to Wikipedia, <http://en.wikipedia.org/wiki/Corticosteroid>

Use of corticosteroids has **numerous side-effects, some of which may be severe:**

Neuropsychiatric: steroid **psychosis, and anxiety, depression**. Therapeutic doses may cause a feeling of artificial well-being ("steroid euphoria"). The neuropsychiatric effects are partly mediated by sensitization of the body to the actions of adrenaline. Therapeutically, the bulk of corticosteroid dose is given in the morning to mimic the body's diurnal rhythm; if given at night, the feeling of being energized will **interfere with sleep**. An extensive review is provided by Flores and Gumina.

Cardiovascular: Corticosteroids can cause sodium retention through a direct action on the kidney, in a manner analogous to the mineralocorticoid aldosterone. This can result in fluid retention and hypertension.

Metabolic: Corticosteroids cause a **movement of body fat to the face and torso**, resulting respectively in "moon face" and "buffalo hump". and away from the limbs. Due to the diversion of amino-acids to glucose, they are considered **anti-anabolic**, and long term therapy can cause **muscle wasting**

Endocrine: By increasing the production of glucose from amino-acid breakdown and opposing the action of insulin, corticosteroids can cause hyperglycemia, insulin resistance and **diabetes mellitus**.

Skeletal: Steroid-induced **osteoporosis** may be a side-effect of long-term corticosteroid use. Use of inhaled corticosteroids among children with asthma may result in decreased height.

Gastro-intestinal: While cases of colitis have been reported, corticosteroids are therapeutically employed when the colitis has an auto-immune nature, e.g. ulcerative colitis and Crohn's disease. While the evidence for corticosteroids causing peptic ulceration is relatively poor except for high doses taken for over a month, the majority of doctors as of 2010 still believe this is the case, and would consider protective prophylactic measures.

Eyes: chronic use may predispose to **cataract** and retinopathy.

Vulnerability to infection: By suppressing immune reactions (which is one of the main reasons for their use in allergies), steroids may cause infections to flare up, notably candidiasis.

Pregnancy: Corticosteroids have a low but significant teratogenic effect, causing a few birth defects per 1,000 pregnant women treated. Corticosteroids are therefore contraindicated in pregnancy.

Habituation: Topical steroid addiction (TSA) has been reported in long-term users of topical steroids (users who applied topical steroids to their skin over a period of weeks, months, or years). TSA is characterised by uncontrollable, spreading dermatitis and worsening skin inflammation which requires a stronger topical steroid to get the same result as the first prescription. When topical steroid medication is lost, the skin experiences **redness, burning, itching, hot skin, swelling, and/or oozing** for a length of time. This is also called 'red skin syndrome' or 'topical steroid withdrawal'(TSW). After the withdrawal period is over the atopic dermatitis can cease or is less severe than it was before.

Corticosteroids were voted Allergen of the Year in 2005 by the American Contact Dermatitis Society.

My Top Ten Reasons Not to Get a Cortisone Shot

by Ross A. Hauser, M.D., www.caringmedical.com

"My doctor wants to give me a cortisone shot. What do you think?" "Cortisone helped me before, why shouldn't I get another shot?" "Is Prolotherapy going to hurt like a cortisone shot?" "The questions go on and on. The mighty cortisone shot has its supporters, but they are rapidly declining. As books such as *Prolo Your Pain Away!* and *Prolo Your Sports Injuries Away!* gain in popularity, and when people finally realize what cortisone is doing to their bodies, they will revolt and seek out alternatives such as Prolotherapy. Below are my top ten reasons for not getting a cortisone shot. For those desiring scientific support for this, please read the two books mentioned above.

Reason #1: Cortisone Inhibits the Healing of Injured Connective Tissues

Pathophysiology 101 is that the body heals by inflammation. No inflammation, no healing. It is that simple. When a person sprains an ankle, the persistent swelling for one to three days is the body's attempt to heal the area. If you want to stop healing, just stop inflammation. This is exactly what cortisone does.

One of the first people to determine the effects of cortisone on ligament, tendon, and joint healing was George S. Hackett, M.D., who coined the term "Prolotherapy". In the mid- 1950s, he did studies where he injected injured ligaments, tendons, and joints with various agents, including cortisone. He found that cortisone inhibited the healing of these stretched and torn connective tissues, but that if it was mixed with a proliferant (Prolotherapy) it was strong enough to even inhibit the healing from Prolotherapy.

Reason #2: Cortisone Inhibits the Healing of Prolotherapy

Modern medicine has forgotten the first rule of healing: The body heals by inflammation. The whole inflammatory cascade, including phagocytosis (immune cells cleaning up the area), angiogenesis (new blood vessel formation), and fibroblast formation (new collagen formation) is inhibited by cortisone. Cortisone also inhibits the migration of the immune cells to the injured area. This migration and repair process is what causes the pain. Cortisone inhibits this repair, so the person feels better. The person getting a cortisone shot sacrifices healing for pain control. This is a bad choice because they now have a weakened structure that they think is fine - so they continue to do sports and activities, not realizing that they are accelerating the degenerative process.

Reason #3: Cortisone Accelerates the Degenerative Process

Cortisone, by inhibiting the normal healing inflammatory reaction, accelerates the degenerative process in the tendons, ligaments, and joints in which it is injected. It also gives the person a false sense of security that the area is healed, when it is not. The combination of a cortisone shot and follow-up exercise is an exceptionally deadly combination for cartilage. Nothing but arthroscopic shaving will degenerate cartilage quicker. If you don't believe it, look at the studies in the book *Prolo Your Sports Injuries Away! Curing Sports Injuries and Enhancing Athletic Performance with Prolotherapy*. Studies on animals have shown that even one cortisone shot into an area has been shown to cause *irreversible* biochemical damage to joints and cartilage. One of the quickest ways to cartilage deterioration and/or a hip or knee replacement is a cortisone shot into these areas.

Reason #4: Cortisone Shots Mask the Pain and Injury

Cortisone, by blocking the healing, does not allow the injured structure to send off a pain signal that something is wrong and needs to be fixed. Cortisone, at best, then just masks the pain and injury. The injury continues, but because there is no pain signal, the person thinks everything is okay, when it is not. The only thing that can occur is that the injury continues and accelerates. If the cortisone shot

was really “successful,” the injured structure may be permanently unable to fire a pain signal, and thus will not hurt anymore. What more commonly happens is that the structure further deteriorates to the point that it overcomes the inhibitory effects of the cortisone shot and starts to hurt. The problem is that the person runs back to their Orthopedist for another one of those “wonderful” cortisone shots; never realizing that the very shot is what is causing their pain and accelerated joint destruction. Such a person is on a slippery slope that could end their athletic career. What is forgotten are the thousands of people who are unable to enjoy their retirements and are in nursing homes because they have lost the ability to walk because of severe hip, back, and knee arthritis. The cause is never spoken about - except here and in our books. The cause of most unhappy retirements is because of Cortisone Shots! Their cousins the anti-inflammatories, of course, are also to blame.

Reason #5: Cortisone Shots Cause People to Need Joint Replacements

Nothing can degenerate a joint quicker than a cortisone shot (except, perhaps, arthroscopy with cartilage and meniscus shaving). The number of joint replacements in this country will soon reach 1 million per year. Your risk of needing a joint replacement is about one in ten. Ten percent of people in the US will get a joint replacement. Guess what the percentage of those needing a joint replacement are those who have had a cortisone shot? Correct, just about 100%. You want a joint replacement? Just keep having cortisone or its cousins injected into your joints, ligaments, and tendons. Cortisone is a poison to the connective tissues of the body, including cartilage, muscles, ligaments, menisci, and tendons. Thus, when cortisone is injected into these structures the death of cells is seen. You want to see the death, read *Prolo Your Sports Injuries Away!*. What, are you chicken? Don't like to see death? I don't blame you, but I do blame cortisone.

Reason #6: Cortisone Shots Cause People to Need Surgeries by the Same People That Gave the Shot!

Most cortisone shots for pain are given by Orthopedic Surgeons. Surgeons love surgery! When they give people cortisone shots, they are doing it in good faith, never realizing that the very shot they are giving will help land the person in the surgical suite. Cortisone helps land people in the arthroscopy suite to get their “damaged” menisci, ligaments, tendons, and cartilage shaved. The orthopedist and the patient never have a clue that it was the anti-inflammatories prescribed by the orthopedist and cortisone shots given by him/her that was the cause of the damage. You have a damaged joint or spine! Wake up before it is too late. Anti-inflammatories and cortisone shots are what are causing people to need laminectomies, discectomies, fusions, tendon repairs, and other salvage operations. Salvage your spine and joints before it is too late. Just say “no” to cortisone.

Reason #7: Cortisone Shots Cause Premature Aging

Healthy aging involves being active for life. As long as a person makes sure that injuries heal, there is no reason they cannot be active for life! Once cortisone enters a joint, tendon, ligament, cartilage, or menisci, then complete healing is inhibited. Suppressing an injury is a great prescription for later-in-life immobility, pain, anti-inflammatories, surgery, or in summation, premature aging.

Reason #8: Cortisone Shots End Dreams

They come in every day to Caring Medical in Oak Park. Men and women who now can't even walk without pain, but yet in their day they were “dream makers”. The superstars of yesteryear are now left hobbling along. Even sadder are the elite athletes who come in to have their dreams dashed by a degenerated joint caused at the hands of their “team physician”. Everybody loves a star athlete, but take away that athletic prowess and then who loves them? Nobody, except mom, dad, significant other, and Prolotherapist. That is it.

Prolotherapists love to help people regain their dreams. The dream is playing in the NBA, PGA tour,

or perhaps just getting back to the high school team pick-up games on the weekend, or the tennis matches on the weekend. Whether we want to admit it or not, athletic activities, exercise, and being active are very important to all of us. Sure guys watch too many athletic events on T.V. But take away the ability to be active for any of us, and panic hits. Most of the time this inability to play sports or exercise is in part due to a cortisone shot. Show me a chronically injured joint and I'll show you where cortisone has been. Don't end your dreams by getting a cortisone shot. You can do better. You have to, your future activity level depends on it.

Reason #9: Cortisone Shots Keep People From Getting Healing Therapies

People want the easy way out. We have instant oatmeal, drive-up lunch stops, drive-up espresso, soon we will have drive-up bathrooms. Don't ask me how the latter will work. What is easier than getting a cortisone shot? "Why not? Insurance will pick it up." Yeah, right buddy, they will pick up your future hip replacement too!

By getting a cortisone shot and masking the pain, people do not get the healing therapies they need. Any therapy that helps increase circulation to the area, helps healing. Therapies such as exercise, myofascial release, rolfing, magnets, massage, chiropractic physiotherapy, kinesiotherapy, acupuncture, herbs, vitamins, and a host of others help people truly heal injuries. When people pop anti-inflammatories and get cortisone shots - it is like taking the battery out of a blaring fire alarm while a fire is blazing. "No problem here." "What do you mean? You dope, the alarm means there's a fire!" This illustration seems silly. Who would take the batteries out of the fire alarm during a blazing fire and state "no problem here."

Yeah, stupid, huh? Well, what could be stupider than have a fire blazing in a tendon, ligament, or joint and stomping out the healing with a cortisone shot? Don't take the "alarm signalers" out of your injured structures. Obey thier wishes and get help. You may need a shot, but not one filled with cortisone, but one juiced up with healing!

Reason #10: Cortisone Shots Keep People From Getting Prolotherapy

Cortisone and Prolotherapy shots are the opposite. Consider the following:

	<u>PROLOTHERAPY</u>	<u>CORTISONE</u>
EFFECT ON HEALING	ENHANCED	INHIBITED
EFFECT ON REPAIR	ENHANCED	INHIBITED
EFFECT ON COLLAGEN GROWTH	ENHANCED	INHIBITED
EFFECT ON TENDON GROWTH	ENHANCED	INHIBITED
EFFECT ON LIGAMENT GROWTH	ENHANCED	INHIBITED
EFFECT ON CARTILAGE GROWTH	ENHANCED	INHIBITED

To heal an injury, a person needs to receive Prolotherapy. Perhaps this is why I dislike cortisone shots the most. They keep people from healing their injuries. The only way healing can take place is if they allow the body to heal the area via inflammation. If the body can't do it, then one has to receive Prolotherapy, which will simulate the normal healing inflammatory reaction. The repair mechanisms of the body are thus stimulated and ultimately the traumatic, joint, spine, or sports injury is healed.

Alternative to Cortisone Shots

by Ross Hauser, MD, www.caringmedical.com

Over the years we have seen many patients who have received corticosteroid (more commonly referred to as cortisone) injections for joint pain. This sounds like a good solution to relieve pain but can leave patient with a worse chronic pain after the injected cortisone runs its course.

Corticosteroid injections have been used for a very long time. Their anti-inflammatory and pain relief properties have made its use become very common practice within the medical community and society as a whole. They have been shown to be effective in decreasing the inflammation and pain of ligament injuries for up to 8 weeks; however, these same properties inhibit the opposite ones of ligament tissues that would bring about the proper healing of muscles.

Since the body heals via inflammation, cortisone inhibits healing simply by its mere nature. Instead of regenerating ligamentous tissue, cortisone injections cause further degeneration of the weakened structure and longer and more painful healing periods and symptoms.

Cortisone Prevents Healing at the Cellular Level

The healing process that follows patients with chronic and acute injury has three characteristic phases: inflammatory, proliferative and remodeling. The first phase, the inflammatory-reparative phase, sets the stage for the others, and is critically affected by the treatment options chosen. These options can either block or stimulate the healing process. In other words, it can either heal the affected area or make it worse.

So what are the treatment options? Cortisone as well as other anti-inflammatories, in addition to the RICE (rest, ice, compression and elevation) protocol– which has very recently been rescinded by its author due to its detrimental effect on healing. All of these modalities provide temporary pain relief, but hinder healing.

Now new research from the Mayo Clinic says cortisone may hinder the native stem cells in cartilage. (Mesenchymal stem cells (MSCs) are the direct progenitors of chondrocytes and other musculoskeletal tissue.) cortisone threatens their innate regenerative capacity in exchange for temporary analgesia.¹

Stem Cell Therapy as well as Prolotherapy can serve as an alternative to cortisone injections because they promote healing.

Prolotherapy stimulates the normal inflammatory-reparative mechanisms of the body, encouraging normal collagen and extracellular matrix growth, which causes the connective tissues, ligaments and tendons to become thicker and stronger.

Cortisone Injection Risks

Corticosteroids are the main hormone secreted by the adrenal gland, the small gland located on top of the kidneys. The typical corticosteroid is cortisol, also called hydrocortisone. Its many effects allow us to live in an ever-changing environment. For example, our body normally produces cortisol in response to an allergic reaction, or to keep our blood sugar high when we haven't eaten for quite a long time. They are especially necessary for normal bodily functions during times of stress.

Corticosteroids are used to provide anti-inflammatory relief in affected areas of the body. However, the synthetic analogues used are many times stronger than our naturally occurring forms. They lessen swelling, redness, itching and allergic reactions, and, in addition to their use for acute and chronic pain, are often used as part of the treatment for a number of different diseases, such as severe

allergies or skin problems, asthma, or arthritis. The discovery that they could be injected was received with enthusiasm, and led to widespread use.

Shortly after doctors started injecting cortisone and other steroids into knee joints in the 1950s, researchers began noting severe problems of joint degeneration and so discouraged the use of cortisone injections. Today, despite the dangers, cortisone use is widespread and has become the standard of care.

The research on cortisone:

- Benefits of cortisone injections are short-lived.² Researchers “concluded that intra-articular corticosteroids reduce knee pain for at least 1 week and that intra-articular corticosteroid injection is a short-term treatment of a chronic problem.”³
- Dangers of cortisone injection include cartilage and joint destruction, especially in those with osteoarthritis of the joint. “Corticosteroid therapy as well as NSAIDS can lead to destruction of cartilage, suggesting that a positive effect on joint pain may also be associated with accelerated joint destruction, which is an extremely important factor in a chronic, long-term condition such as osteoarthritis.”⁴
- Cortisone has a deleterious effect on soft tissue healing by inhibiting blood flow to the injured area, new blood vessel formation, immune cells like leukocytes and macrophages, protein synthesis, fibroblast proliferation and ultimately collagen formation. Cortisone weakens collagen and therefore soft tissue such as ligaments and tendons.
- Cortisone causes bone death ⁵
- Cortisone inhibits the release of growth hormone, which further decreases soft tissue and bone repair.
- Cortisone injections can lead to painful tendon and ligament ruptures. They compromise tendon and ligament strength, a scary finding considering that many athletes return to the game or the sport shortly after an injection.⁶
- Cortisone injections degenerate the joint. Nothing can degenerate a joint quicker than cortisone shots (except, perhaps, arthroscopy with cartilage and meniscus shaving). Your risk of needing a joint replacement is about one in ten. Ten percent of people in the US will get a joint replacement. If someone has had cortisone injected, the percentage of needing joint replacement rises substantially. Just keep having cortisone or its cousins injected into your joints, ligaments, and tendons. Cortisone is a poison to the connective tissues of the body, including cartilage, muscles, ligaments, menisci, and tendons. Thus, when cortisone is injected into these structures the death of cells is seen.
- Cortisone injections can predispose a joint to infection.
- Cortisone shots cause degeneration which eventually leads to surgery.
- These last two points were the subject of new and independent research. Here is a summary of that research
- Intraarticular hip injections of corticosteroids and hyaluronic acid may be used to treat hip osteoarthritis. Although sterile technique is recommended to avoid infiltration of the joint with microorganisms normally found on the surface of the skin there remains a risk of infection. (This is not dissimilar to risks with Prolotherapy or any injection.) **HERE IS THE DIFFERENCE** -This may increase the risk of joint infection, particularly when coupled with corticosteroid-related immunosuppression .
- Therefore, in the setting of total hip replacement, preoperative receipt of a hip injection may increase risk of infection, leading to early revision arthroplasty.
- While the researchers were unable to determine what agent was injected into the joint prior to surgery, they concluded that the most likely therapies were corticosteroids and hyaluronic acid, with or without a local anesthetic.
- As hyaluronic acid has no proven benefit for hip osteoarthritis, it is likely that most of the

injections were of corticosteroids.

- Corticosteroid joint injection may have local immunomodulatory effects that may increase risk of infection following hip replacement.

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Corticosteroid joint injection may have local immunomodulatory effects that may increase risk of infection following hip replacement.

If so, there may be a period of time required for these effects to be “cleared” before a hip replacement can be safely implanted into the joint. Regardless of the solution injected, intraarticular injections expose the joint to the external environment and may allow seeding by microbes, particularly when improper sterile technique is used. Further research is warranted to determine whether the documented increased risk of infection following hip injection differs according to the solution used (corticosteroids versus hyaluronic acid).⁷

Nevertheless, cortisone shots are still considered the standard of care for the injured athlete and other painful or inflammatory conditions.

The Prolotherapy Alternative to Cortisone

Prolotherapy stimulates, rather than interferes with, the normal healing process of inflammation. While corticosteroids inhibit the enzymes that block the production of prostaglandins and leukotrienes, which mediate the inflammatory process, Prolotherapy stimulates them.

By blocking the production of these enzymes, cortisone has a deleterious effect on soft tissue healing by inhibiting blood flow to the injured area, new blood vessel formation, immune cells like leukocytes and macrophages, protein synthesis, fibroblast proliferation and ultimately collagen formation. Prolotherapy doesn't.

In addition, the collagen that forms in ligaments and tendons treated with cortisone is disrupted and weaker, while that treated with Prolotherapy is—you guessed it—stronger. Prolotherapy provides the stimulus that is needed to bring in healing fibroblasts and allow them to proliferate and lay down

new collagen fibers. This causes the connective tissues, ligaments and tendons to become thicker and stronger. Prolotherapy stimulates the normal inflammatory-reparative mechanisms of the body, encouraging normal collagen and extracellular matrix growth.

Prolotherapy strengthens and repairs the weakened and degenerated structures. In the case of athletic injuries, it will enhance athletic performance as the injured structures become stronger instead of weaker. The end result is a stronger joint and athletes who are back playing their sport instead of on the operating table getting their arthritis scraped or, even worse, getting a joint replacement.

Prolotherapy works by stimulating inflammation and since the body heals by inflammation, Prolotherapy concurrently stimulates healing. Comprehensive Prolotherapy includes injections into a joint and all ligament and tendon attachments that surround that joint. As these structures heal from treatments, the joint becomes more stable and causes less pain.

Prolotherapy is an alternative and effective treatment to heal chronic musculoskeletal injuries. Comprehensive Prolotherapy involves the injection of natural substances (named orthobiologics) used to induce healing within the body. There are two types of orthobiologics: those that come from the body (i.e. cellular Prolotherapy such as Platelet Rich Plasma Therapy, bone marrow, and adipose tissue) and those that naturally induce healing, such as dextrose (a chemical equivalent to normal d-glucose that is found in the body). Dextrose is a heavily studied proliferant and is extremely safe and effective. It can be used in high concentrations without threatening side effects. This allows us to treat multiple body parts on the same person in the same visit.

In summary, while cortisone shots weaken an injured area even further, Prolotherapy stimulates the body to repair it. Prolotherapy stimulates blood flow to the area, protein synthesis, fibroblast proliferation and ultimately collagen formation. The choice is simple: cortisone shots that lead to proliferative arthritis of joints or proliferative injections (Prolotherapy) that stimulate the repair of the injured tissue. One of the greatest benefits of Prolotherapy is that almost everyone, even extreme athletes, can still continue to train while receiving treatments as well.

References to this article

1. Wyles CC, Houdek MT, Wyles SP, et al. Differential cytotoxicity of corticosteroids on human mesenchymal stem cells. Clin Orthop Relat Res. 2015 Mar;473(3):1155-64. doi: 10.1007/s11999-014-3925-y. Epub 2014 Sep 4.
2. Hirsch G, Kitas G, Klocke R. Intra-articular corticosteroid injection in osteoarthritis of the knee and hip: factors predicting pain relief—a systematic review. Semin Arthritis Rheum. 2013 Apr;42(5):451-73. doi: 10.1016/j.semarthrit.2012.08.005. Epub 2013 Jan 29.
3. Hepper CT, Halvorson JJ, Duncan ST, Gregory AJ, Dunn WR, Spindler KP. The efficacy and duration of intra-articular corticosteroid injection for knee osteoarthritis: a systematic review of level I studies. J Am Acad Orthop Surg. 2009 Oct;17(10):638-46.
4. Sofat N, Kuttapitiya A. Future directions for the management of pain in osteoarthritis. Int J Rheumatol. Apr 2014; 9(2): 197–276.
5. Corticosteroid injections for osteoarthritis of the knee: meta-analysis. BMJ 2004; 328:869.
6. Sweetnam R. Corticosteroid arthropathy and tendon rupture. Journal of Bone and Joint Surgery. 1969: 397-398.
7. Ravi B, Escott BG, Wasserstein D, Croxford R, Hollands S, Paterson JM, Kreder HJ, Hawker GA. Intraarticular hip injection and early revision surgery following total hip arthroplasty: a retrospective cohort study. Arthritis Rheumatol. 2015 Jan;67(1):162-8. doi: 10.1002/art.38886.

Q. My doctor suggested an “epidural” shot for my pain. Is this a good idea?

A. To be frank, no, in my opinion this is a bad idea. The epidural is painful and costly, the steroid that are injected may weaken tissue, additives within the medication have been reported to occasionally cause scarring of the nerve roots which will set up a new and untreatable source of chronic pain, and the results are nil to fair, and only very temporary (usually about a week, maximum, very rarely a month), and there is absolutely no long term therapeutic value to the injection. So in my opinion, why bother?

--- Answered by Robert Filice, M.D., www.prolonews.com

Your Questions about Steroids & Cortisone Answered

by Ross Hauser, MD, www.getprolo.com

The quickest way for an athlete to lose strength in a joint is to inject cortisone in it.

Corticosteroids, such as cortisone and Prednisone, have an adverse effect on bone and soft tissue healing, they inactivate vitamin D, limiting calcium absorption by the gastrointestinal tract, and increasing the urinary excretion of calcium. Bone shows a decrease in calcium uptake with cortisone use, ultimately leading to weakness at the fibro-osseous junction. Corticosteroids also inhibit the release of Growth Hormone, which further decreases soft tissue and bone repair. Ultimately, corticosteroids lead to a decrease in bone, ligament, and tendon strength.

Corticosteroids inhibit the synthesis of proteins, collagen, and proteoglycans in articular cartilage, by inhibiting chondrocyte production, the cells that comprise and produce the articular cartilage. The net catabolic effect (weakening) of corticosteroids is inhibition of fibroblast production of collagen, ground substance, and angiogenesis (new blood vessel formation). The result is weakened synovial joints, supporting structures, articular cartilage, ligaments, and tendons. This weakness increases the pain and the increased pain leads to more steroid injections. Cortisone injections should play almost no role in sports injury care. Although anti-inflammatory medications and steroid injections reduce pain, they do so at the cost of destroying tissue.

The problem with athletes is that they look for quick relief. The problem with cortisone is that the athlete may get pain relief, but it may be at the expense of permanent inability to participate in athletics. Athletes often receive cortisone shots in order to play. They go onto the playing field with an injury of such significant magnitude that they received a cortisone shot to relieve the pain. Unfortunately, they cannot feel the pain anymore so they play as if there was no injury. We know that the injury could not possibly be healed because of the tremendous anti-healing properties of cortisone. Thus the athlete is further injured from the cortisone, as well as playing with an injury, thereby worsening the already bad injury.

Knee Injury and Cortisone

by Ross Hauser, M.D., Marion Hauser, M.S.R.D.

Corticosteroids, such as cortisone and Prednisone, have an adverse effect on bone and soft tissue healing. Corticosteroids inactivate vitamin D, limiting calcium absorption by the gastrointestinal tract, and increasing the urinary excretion of calcium. Bone also shows a decrease in calcium uptake with cortisone use, ultimately leading to weakness at the fibro-osseous junction. Corticosteroids also inhibit the release of Growth Hormone, which further decreases soft tissue and bone repair. Ultimately, corticosteroids lead to a decrease in bone, ligament, and tendon strength.

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net catabolic effect (weakening) of corticosteroids is inhibition of fibroblast production of collagen, ground substance, and angiogenesis (new blood vessel formation). The result is weakened synovial joints, supporting structures, articular cartilage, ligaments, and tendons. This weakness increases the pain and the increased pain leads to more steroid injections. Cortisone injections should play almost no role in sports injury care. Although anti-inflammatory medications and steroid injections reduce pain, they do so at the cost of destroying tissue. In a study conducted by Siraya Chunekamrai, D.V.M., Ph.D., steroid shots, of a substance commonly used in humans, were given to horses. The injected tissue was looked at under the microscope. The steroid shots induced a tremendous amount of damage, including chondrocyte necrosis (cartilage cell damage), hypocellularity (decreased number of cells) in the joint, decreased proteoglycan content and synthesis, and decreased collagen synthesis in the joint. All of these effects were permanent.

Dr. Chunekamrai concluded, "...the effects on cartilage of intra-articular injections of methylprednisolone acetate (steroid) were not ameliorated at eight weeks after eight weekly injections, or 16 weeks after a single injection. Cartilage remained biochemically and metabolically impaired." (Chunekamrai S. Changes in articular cartilage after intra-articular injections of methylprednisolone acetate in horses. *American Journal of Veterinary Research* 1989;50:1733-1741)

In this study, some of the joints were injected only one time. Even after one steroid injection, cartilage remained biochemically and metabolically impaired. Other studies have confirmed similar harmful effects of steroids on joint and cartilage tissue. A cortisone shot can permanently damage joints.

The problem with athletes is that they look for quick relief. The problem with cortisone is that the athlete may get pain relief, but it may be at the expense of permanent inability to participate in athletics. Athletes often receive cortisone shots in order to play. They go onto the playing field with an injury of such significant magnitude that they received a cortisone shot to relieve the pain. Unfortunately, they cannot feel the pain anymore so they play as if there was no injury. We know that the injury could not possibly be healed because of the tremendous anti-healing properties of cortisone. Thus the athlete is further injured from the cortisone, as well as playing with an injury, thereby worsening the already bad injury.

Cortisone is so dangerous to the athlete because it inhibits just about every aspect of healing. Cortisone inhibits prostaglandin and leukotriene production. It also inhibits chondrocyte production of protein polysaccharides (proteoglycans), which are the major constituents of articular ground substance. Behrens and colleagues reported a persistent and highly significant reduction in the synthesis of proteins, collagen, and proteoglycans in the articular cartilage of rabbits who received weekly injections of glucocorticoids. They also reported a progressive loss of endoplasmic reticulum, mitochondria, and Golgi apparatus, as the number of injections increased.

Exercise has the opposite effect. Exercise has been shown to positively affect articular cartilage by increasing its thickness, enhancing the infusion of nutrients, and increasing matrix synthesis. However, the effects of doing them together were not studied until recently.

Dr. Prem Gogia and associates at the Washington University School of Medicine in St. Louis, Missouri, did an excellent study bringing out the dangers of an athlete exercising after receiving a cortisone shot. (Gogia, P. Hydrocortisone and exercise effects on articular cartilage in rats. *Archives of Physical Medicine and Rehabilitation*. 1993; 74:463-467.)

They divided animals into three groups:

1. Group One: received a cortisone shot
2. Group Two: received a cortisone shot and exercised

3. Group Three: control group, received no treatment

This study was done in 1993 and was the first study to look at the effects of exercising after receiving a cortisone shot. The authors performed this study because it is common practice in sports medicine to give an athlete a cortisone shot for an acute or chronic injury. Athletes are typically returning to full-intensity sports activities within a few hours to one to two days after receiving the shot. The results of the study were unbelievable. The animals receiving the cortisone shots showed a decrease in chondrocytes, but when they received the cortisone shot and exercised, the chondrocyte cell count decreased by another 25 percent. Degenerated cartilage was seen in all of the cortisone-injected animals, but severe cartilage damage was seen in 67 percent of the animals that exercised and received cortisone. The cortisone and exercise group also showed a significant decline in glycosaminoglycan synthesis compared to the other groups. The authors concluded, "...the results suggest that running exercise in combination with intra-articular injections results in damage to the femoral articular cartilage."