Building on Bedrock: Rethinking Orthopedics

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Many of us are familiar with the story of the three blind men encountering an elephant for the first time. One touched its trunk and described the elephant as a long hollow tube. The second touched its leg and described it as thick and wide around as an oak tree. The third touched its tail and described it as a thin wispy creature. The moral of the story, of course, is that what we see is determined by what we chance to encounter and what powers of observation we have at our disposal.

In this article, I propose to rethink how we look at the human body and to show that there is another way of assessing orthopedic problems that merits closer scrutiny. The purpose of this article is to examine, in some detail, the mechanical and structural causes of musculoskeletal pain. I will attempt to demonstrate how the physical body functions as an energetic whole, not simply as a machine with interconnected mechanical parts; and I will argue that the parts of the body cannot be treated in isolation from one another because the body has an ever-adaptable three dimensional structure that is designed to constantly accommodate to the changing conditions of our joints.

Figure 1

Figure 2

A Matter of Perspective

One of the first questions early psychologists investigated was "How do people know what it is that they are seeing?" Some of their experiments used a type of illustration known as a "reversible figure-ground pattern," which requires the viewer to determine whether the "object" is the light area or the dark area of the figure. In reality, the drawing contains two different images, and what the viewer see depends on whether the boundary between light and dark is perceived as belonging to the light area or to the dark area. For example, in Figure 1 on this page, some people see a vase and others see the silhouettes of two faces looking at each other. In Figure 2, some people see an old woman, and some people see a young woman. If you will keep looking at the figures until the images shift, you will see that the figures contain both images. Each drawing can be seen in two different ways; and both images are "correct."

The human body is much the same. What we see depends on how we look at it. If we take a macroscopic view, we look at the big picture, such as the skeleton and how the bones are arranged to form the foundation of our bodies, or the muscles and how they enable us to sit, stand, and run. If we take a microscopic view, we look at what is happening inside our joints or inside our organs. We can see the cartilage and the synovial fluid and how to replace a joint; or we can follow our food through the digestive tract and watch how it is digested. We could even take what we might call a nanoscopic view and watch the mitochondria and DNA work inside our cells, or follow a nerve impulse down a nerve cell and across the synaptic membrane.

In this article, we will examine one of the elements that comprise the macroscopic view of the body. Specifically, we will concentrate on the ligaments, which together with the tendons and fascia comprise the "stiff tissues" of the body. When we focus on the ligaments, which are located on the outside rather than the inside of the joints, an entirely different picture of our bodies emerges, with entirely different implications for why we experience orthopedic problems, how we explain the problems we have, and how we treat and prevent them.

Current Perspectives

In many ways, current mainstream medical thinking views the body in much the same way as we view an automobile. Both are made up of many parts. As long as all the parts are functioning and remain connected to one another, the car, or the body, will function. If you lose a tire, it will be hard for the car to move; but put on a new tire, and the car will move again. Keep changing parts, and, theoretically, you can keep the car running for a very long time.

Whether we think in terms of Western Medicine or Oriental Medicine, we approach the human body in much the same fashion. Keep the knee "lubricated," whether naturally or artificially, for as long as we can; and when it wears out, replace it. Support heart function with herbs or medication for as long as possible; but if a heart valve ceases to function, put in another one. If an artery clogs up, and herbs or medication cannot unclog it, then ream it out. Theoretically, in this way, we can keep the body "running" for a very long time.

The Pathway of Least Resistance

Body parts, like car parts, do not wear evenly. Why does the right knee wear out in some people, but the left knee in other people? Why is it the knee in some people and the hip in others? Why do some people get bunions or carpal tunnel syndrome and others do not?

The answer, of course, is that we are not, strictly speaking, symmetrical. One side is a little different – or a lot different – from the other. We have injuries that affect our sides differently, and we engage in one-sided activities, such as bowling, tennis, driving, and carrying babies or briefcases. Just as our cars wear unevenly when one side is damaged, so do our bodies. Over time, the parts that are injured or that are used more frequently wear out faster.

As we live in, and use, our asymmetrical bodies, they become more and more asymmetrical. The body is an ever-changing structure. How its parts are put together – and how the brain that controls it is organized – is determined by how we use it. For example, when the structure of the body is changed by injury, corresponding changes occur in how the body functions. These functional demands create further changes in structure in two ways. First, the body seeks a structure that will allow it to function with the least restrictions; and, second, asymmetry creates uneven wear and tear.

Click and Clack, the Magliozzi Brothers who co-host "Car Talk" on National Public Radio, gave a good illustration of this principle. One of their listeners called in with a question about replacing the transmission in his Toyota that had 350,000 original miles on the engine. Their advice to him was to go to every junk yard he could and buy up all the used transmissions he could find for his car, and then to keep replacing them as they wore out. Under no circumstances, they told him, should he put a new transmission into his car. The reason is that the parts on an engine with that many miles on it have worn

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in a particular fashion. All the parts are worn, and they have worn in a manner that allows them to function together very effectively, as evidenced by the fact that the engine has lasted 350,000 miles without the need for an overhaul. If he were to put a new transmission into the vehicle, it would be the equivalent of throwing a monkey wrench into the works. The parts would no longer line up properly, and he would no longer have a smoothly running car.

As we use our bodies, our joints also wear unevenly; and, as with an automobile engine, the wear pattern of the parts seeks the pathway of least resistance. If movement is restricted in the sacroiliac joint, then the pelvis will twist so that the least amount of pressure is put on the fewest number of joints. This sets up a cascade, so that the twisted pelvis makes one leg appear to be longer than the other, and one foot hits the ground harder than the other, causing one arch to collapse before the other. These adaptations are the body's effort to reduce the pain and strain of having a non-functioning sacroiliac joint. At some point, though, the body has adapted as much as it can. Muscles and connective tissue reach their maximal stretch, and joints wear away at the point where the pressures are greatest. Eventually there is pain, and the person seeks to do something about it.

When we replace joints, the pathway of least resistance must change. The new joint does not function or wear the same way the original one did, so the wear pattern shifts in a new direction. Using the knee as an example, most artificial knees only flex and extend, whereas our biological knees also rotate, or twist, and sidebend, to some extent. Once we restrict the knee only to flexing and extending, we limit the ways in which it can adapt to restrictions in the sacroiliac joints. Because the body must adapt to sacroiliac restrictions, the adaptation will shift to another joint, such as the ankle and foot or to the other knee, or to the spine, depending on what else is happening in the body.

Seeing the "Light-Area" Figure

Current medical therapies tend to see the muscles or the joints as the most important feature of the body, when dealing with orthopedic problems. For example, the most common treatments prescribed for a hypothetical patient with knee pain are treatments that provide symptom relief inside the joint, such as draining fluid, injecting steroids and anesthetics, and prescribing analgesics, or treatments that strengthen the muscles, such as a course of physical therapy, which might include heat/cold treatments, ultrasound, and exercise.

Treatments that involve some type of joint re-alignment typically are done under force or limit the number of joints that are treated. Some treatments, such as proliferation therapy, address "laxity" in the ligaments. "Prolo therapy," as it is known, involves injecting a sclerosing agent into the ligament to create inflammation and scarring, which is designed to tighten up a loose ligament. If an X-ray or MRI shows the knee joint to be deteriorated or deteriorating, then a recommendation for knee joint replacement is likely to be made.

Similarly, practitioners of acupuncture and Oriental Medicine, energy medicine, and hands-on therapies also focus on the affected muscles or joints, using techniques designed to improve the flow of *qi* and blood and to relax tissues in the joint or throughout the entire body. The goal of these treatments typically is to relieve symptoms such as pain or swelling. If there is a broader goal, it tends to be constitutional (e.g., Kidney Yang Deficiency) rather than an overall view of the skeleton.

The broad range of health professions are all looking at the same problem – a painful knee. Some see the surface structures (swelling, heat, spasms) and address the problem at the surface level. Some see deeper structures (cartilage, synovial fluid) and address the problem there. Some see a small area (the knee itself), and some see a large area (the lower extremities, the entire body). What they all have in common is that they tend to see the knee as a part that can be replaced when the current knee wears out. Most practitioners will look at the knee and identify the knee as the problem. Some will identify the knee as the site of referred pain from the spine or the foot. In other words, referring back to the reversible figure-ground pattern mentioned at the beginning of this article, these practitioners are seeing the light area of the image as the "figure."

This approach works very well in many situations, such as a torn meniscus or a ruptured disc or a broken bone. However, there is another way to look at this knee that can help to explain why the meniscus has torn or the disc has ruptured or that particular bone has broken. The knee is not an isolated joint. Its function depends on the condition of the ankle and foot below it and the hip and low back above it.

Seeing the "Dark-Area" Figure

Architects know that the foundation of a tall building must be set on bedrock if the building is to be stable and enduring. This concept applies to the body as well. I submit that the lumbar spine, sacrum, and pelvis are the structural foundation of the entire body. Problems there translate upward and downward via the ligaments, tendons, fascia, and muscles to create orthopedic, as well as internal medicine, problems elsewhere in the body. The sacroiliac joints are the place where the forces from the upper body and the forces from the lower body meet. Consequently, they are a common problem site. Problems that begin at the sacroiliac joints affect every joint of the body; and a problem in any part of the lower extremities will affect the sacroiliac joints. A restricted sacroiliac joint, i.e., a joint that is not moving properly, forces the structures attached to it to function differently; and joints in the lower extremities that do not move properly force the sacroiliac joints to function differently.

Imagine that the joints of the body are like a fisherman's net. If you lay the net flat on the ground and then pick up one of the knots, all the other knots move as well. Those that are closest to the knot that has been picked up will move more than the knots that are farthest away, but all of the knots will be affected.

Walking requires an alternating lock-stance and pendulum-swing action in the sacroiliac joints (Dorman, 1998). A sacroiliac joint that does not move easily through the lock and swing cycle forces the individual bones that comprise the pelvis to shift out of symmetry in an effort to reduce the strain of walking. There has to be enough space for the leg to swing as we walk or run. If it is not provided by the locking and swinging of the sacroiliac joints, then it will have to be provided by some other

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mechanism, such as an adaptation in the shape of the pelvis or a collapse of the foot. Accommodations in the shape of the pelvis change apparent leg lengths so that one limb strikes the ground harder than the other. The metatarsal arch will break down sooner on the limb that is striking harder, and the foot will appear to "pronate," or rotate toward the midline. As the hip shifts forward, the leg internally rotates and the fibula "freezes" at the knee and at the ankle, stabilizing the leg.

At the same time, the part of the pelvis that has rotated toward the front of the body also changes the dynamics of hip motion. The head of the femur is pushed toward the front of the acetabulum, where it presses on the front of the socket, wearing it away faster and possibly creating a spur inside the joint because the ligament is under constant tension, which is a signal for the body to lay down bone in that direction. The soft tissues become involved as well, trying to hold the hip back, as it were, and keep it from moving too far forward. All these actions create pain and wear and tear, to the point that people start thinking in terms of joint replacements.

With all this shifting in the lower extremities, there is a corresponding shift in the lumbar, thoracic, and cervical spines, a twisting of the rib cage and a corresponding rotation of the shoulder girdle, creating an array of possible effects in the upper extremities and the head, all designed to keep the body in balance and functioning with the least strain. Picking up one knot in the fisherman's net (the sacroiliac joint) has moved every knot in the net. This is the "dark area" figure against which we must evaluate our hypothetical patient's knee pain. In other words, how did the knee get this way, and what can we do about it.

Back to Perspectives

The reason the body can adapt to improperly functioning joints is because those joints are held together by ligaments. In effect, a knee joint is a place where the ends of two bones come together. The bone ends are held in close proximity to each other by the ligamentous capsule that surrounds them. The ligaments are strong enough and stiff enough to hold the bones in close proximity and to bear our weight, yet they are flexible enough to allow the joint to articulate so that we can move. Ligaments connect bone to bone, and tendons connect muscle to bone. The ligamentous capsule has a vacuum inside, which helps give the joint its integrity; and it is filled with synovial fluid, which helps to cushion the movement of the bone ends inside the capsule. The ligaments have some "give;" the capsule is not rigid. It can swell; it can stretch; and it can tear. It is the "stiff" quality of the ligaments – their strength combined with the ability to "give" – that allows our bodies to move and to adapt to asymmetry without tearing apart.

Each joint can tolerate a certain range of normal slippage. There is enough room inside the joint for a certain amount of movement to occur. This is what enables our joints to articulate and what allows us to move. When the bone ends are knocked out of alignment, or when wear and tear causes them to slip out of alignment, the ligamentous capsule will allow the joint to continue to function as long as the misalignment stays within the tolerance levels of normal movement. Beyond that tolerance range, the capsule tightens, or “freezes,” because of the combined effect of the vacuum, the limits of ligament stretch, and the limits imposed by the bony anatomy inside the joint.

If we go back to our hypothetical knee, we can see that the femur that comes down from the hip can be pushed forward or pulled backward by a rotated pelvis and therefore enters the knee joint capsule at a different angle from usual. This changes the angle of the knee and the ability of the fibula to rotate around the tibia. It also changes the angle at which the fibula enters the talar joint, which in turn affects the motion of the ankle and, eventually, the arch of the foot. The knee is at the mercy of what is happening above it and below it. The knee has the greatest capacity to twist and stretch of all the joints in the lower extremity because it is not hemmed in by bony structures such as the acetabulum in the hip or the talar joint of the ankle.

When I look at orthopedic problems from the perspective of the “dark area” image, I find that virtually all involve some sort of misalignment, usually of multiple joints, either as the result of injury or as the result of adaptation along the pathway of least resistance. These misalignments can be corrected, as long as one addresses all the knots in the net, eventually.

Because misalignment does not occur in only one joint, all the joints in the body must be addressed in treatment. The painful knee is part of an entire system which includes, at minimum, the foundation (lumbar spine, sacrum, and pelvis) and the lower extremity (hip, knee, ankle, and foot). The most effective approach is to loosen the stiff tissues (ligaments, tendons, and fascia) and then realign the joints manually. Stiff tissues can be loosened directly with special acupuncture techniques (Rogel, 2007) or somewhat more indirectly with manual methods and specialized exercises. Treatments that address the muscles have no effect on the ligaments because the muscles stretch more than, and therefore release prior to, the ligaments. Because joint alignment has a domino effect throughout the body, ligament treatments must address the entire body.

Taking a Closer Look

Looking again at the asymmetrical body, we will almost always find that one side is restricted and the other stretched. Typically it is the stretched side where we feel the pain, but which is the problem – the stretched side or the restricted side? A related question is, “Where is the problem?” In practice, most people identify the problem as a “tight muscle” or as a “lax ligament.” I submit that the problem is actually a restricted ligament that creates a series of misaligned joints, which in turn create a pattern of tight and loose muscles throughout the body.

The conventional notion is that it is the muscles that create the structural configuration of the body. Note how often we think we can improve our posture by strengthening the muscles that help us stand up straight; or how many times we think that the proper treatment for a tight muscle, such as a hamstring, is to stretch it out; or how often we attempt to make a weak muscle stronger by doing weight-bearing exercise; or how often our strategy for rehabilitating an injured joint is to strengthen the big muscles that control that joint.

The problem with this approach is that the muscles are the “stretchiest” of all the tissues, and they can mask a host of problems. Within limits, of course, they will adapt to any structural configuration of

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the body. Strengthening the muscles does make them hurt less, but the muscles have little impact on the actual alignment of the spinal vertebrae or of any other joint. If nothing else changes, we will need to continue stretching out tight muscles and strengthening weak muscles until we die. If we stop stretching or stop strengthening, the muscle returns to its tight or weak state.

This is because the muscles are attached to bone, and they go where the bones go. Indeed, they "move" the bones, but they do not align them. Alignment is determined by ligaments. A muscle that is "too tight" can be relaxed immediately by realigning the joints to which it is attached. The same is true for most "weak" muscles; they will strengthen immediately when the joints are realigned (though, of course, they will fatigue quickly until they are retrained).

So the hard tissue (bone) serves as a platform onto which muscles attach. The stiff tissue (primarily ligaments but also tendons and fascia) holds the bones close enough together that they can articulate as joints but allows the bones to shift within certain tolerance levels within the joints. The soft tissue (primarily muscles) accommodates to allow us to function under many different conditions of alignment and misalignment. Put another way, it is the function of the stiff tissue to hold the hard tissues in proximity as the soft tissues pull on the hard tissues to create movement. The "tolerance levels" for misalignment within the joint capsules are determined by the shapes of the bones and the condition of the stiff and soft tissues. Poor alignment within the joint capsule at one end of a bone affects the alignment within the joint capsule at the other end of the bone. This accommodation to restrictions and misalignments dominos from joint to joint, creating chronic wear-and-tear patterns throughout the entire body.

An effective treatment, then, for our hypothetical patient with knee pain begins with determining the condition of all the joints in the low back, pelvis, and lower extremities. Treatment would involve releasing the restricted tendons and ligaments in the lumbar and sacrum (especially the sacroiliac joints and pubic joint), restoring the pelvis to its proper position, mobilizing the hip joints (not just muscles), and realigning the joints of the knees, ankles, and feet. These corrections can be made more quickly and maintained for longer periods if the patient has deep tissue massage and/or does some type of exercise that strengthens the ligaments, such as water aerobics, qi gong, tai qi, Pilates, and some types of yoga (such as yin yoga) and physical therapy. Exercises that concentrate on stretching muscles are not as effective in maintaining structural alignment. Other types of corrective therapies may be needed, depending on the patient, such as orthotics and braces; and some patients will need draining of fluid and pain medications. How long the process takes depends on how extensive and how chronic the compensations are, and whether the problem began with injury or wear and tear.

If the choice was made to replace the knee, the effect of this new knee needs to be taken into account. The new knee flexes and extends, but it does not rotate and sidebend the way the original knee did. So, when the twisting forces from the non-functioning sacroiliac joint work their way down the leg, they encounter a different condition than previously. Since the knee is now more rigid, it cannot accommodate to the sacroiliac joint the way that the original knee did. Because the original forces that caused the deterioration of the knee are still present, but since the knee can no longer respond the way that it did, something else must adapt, such as the foot or the low back. The body will find a new pathway of least resistance, and the forces will act on another joint or set of joints and muscles somewhere else.

Conclusion

In this article, I am offering another perspective on orthopedic problems, and I would suggest that orthopedic issues will be found to be a much more important influence on internal medicine problems than we realize. In summary, I propose the following.

- The body adapts in multiple ways to injury and to patterns of wear and tear, cascading along the pathway of least resistance from joint to joint throughout the body and to the internal organs as well.
- These adaptations gradually become "locked in" as the bony ends within the joint capsules encounter natural bony and ligamentous obstructions that prevent the joint from dislocating.
- These misalignments can be unlocked, and the body can be guided toward a more symmetrical structure.
- Most treatments focus on muscles, but the key to unlocking misaligned joints is to be found in the stiff tissues, primarily the ligaments.
- Most treatments focus on lax ligaments or weak/tight muscles, but the "locks" are located at the restricted joints.
- Physical activity and most forms of treatment can reduce pain and help people function better, but they have little or no effect on correcting misalignments within the joints.
- The process of unlocking restrictions does not have to be painful to be effective.
- Joints will not stay in alignment when the correction is forced; and joints will not return to alignment by creating strong muscles.
- All parts of the body need to be functioning properly, to the extent possible, in order for the corrections to be maintained.
- Patients can learn to notice their misalignments, and they can actively participate in fixing them.

Given the complexity of the human body and the great number of problems that can occur, it is important for the health professions to work together, as each brings something unique to patient care, and patients need all of what we have to offer. I hope that by delineating the light-area and dark-area images in our body patterns we will broaden our understanding of patients' problems and better utilize our skills at solving them, for I believe that it is possible to talk in terms of "cures," when we all work together.•

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