Pain as part of human existence has been depicted from the time of the earliest cave paintings, through oral history and throughout written history. Descriptions of suffering include the hurt involved in childbirth through the full gamut of pain-producing experiences. Pain is reported in terms like aching, burning, lighting, lancinating, throbbing, pressure and through other adjectives, gestures and facial expressions. When mothers talk about babies, they remark on the difference between an angry cry and one that communicates real hurt. As amputees, we are concerned with all of these aspects of pain plus one form of suffering that non-amputees are spared: phantom limb pain (PLP). It was first described by Pare, a French surgeon, in 1551 and labeled as phantom because it refers to patients’ descriptions of pain in places that no longer exist: amputated limbs.

How much of a problem?

Approximately 185,000 surgical amputations were performed in 1996 in the United States, according to the U.S. Department of Health and Human Services. Studies suggest as many as 70 percent of amputees suffer burning, cramping and other types of phantom pain in the first few weeks after amputation. In addition, painless phantom sensations, or the patient’s occasional “feeling” of the missing part, are almost universal. Although commonly thought of in relation to limb amputation, PLP has also been described following the loss of teeth, fingers, intestines, breasts and the penis. Unfortunately, even seven years after amputation, about half of us still suffer with burning, cramping, throbbing or crushing phantom limb pain at times. This form of discomfort has been tough to manage because, unlike most forms of pain, PLP does not have a simple “tissue injury produces pain” explanation. Phantom pain can be a temporary part of becoming an amputee and, for a smaller number of amputees, become a lifelong life-altering pain problem for them and their families. The economic toll for chronic pain (other than cancer) in this country is in excess of $100 billion per year.

Even after the initial healing period, the new amputee can still experience problems from the original tissue injury or health problem. For example, an amputation done for circulation problems may still have an area with very little blood supply and thus generate discomfort, and diabetes will still affect parts of limbs remaining after amputation. Understandably, ill-fitting prostheses can be a source of discomfort. In addition, the remaining healthy tissues and joints, now asked to work differently, can become a source of discomfort long after surgical wound healing. After surgery, other muscles and joints usually have to carry extra stresses and loads. These extra stresses can lead to pain in unaffected areas. Unrelated to the amputation, amputee patients are also subject to the same pain problems experienced by the rest of the world such as arthritis, headaches and back pain. It’s easy to focus on this single novel and interesting form of pain called phantom pain. However, the hurting patients (and pain managers) must keep in mind that the presence of PLP does not prevent amputees from acquiring other more common painful conditions from injuries, aging and illness.

People who have a painful limb prior to amputation have a greater chance of developing bothersome chronic phantom limb pain; therefore, it’s in the amputee’s best interest to become familiar with the body’s internal alarm signal - pain. This alarm informs us that something is being stressed or is broken and that we need to change something. We may need to change an activity, stop to care for an injury or alter how we live and work with aging or injured parts. We frequently use nonconventional postures and must use affected and unaffected joints, tendons and muscles harder than ever before. These alterations can lead to over-use syndromes causing strain, injury, inflammation and further pain.

Mechanisms of pain - the tissue level

When the body is damaged (or during surgery), the broken cells release a group of chemicals that cause inflammation and stimulate our alarm system to notify our brain that something is wrong. The same alarm can be sounded directly by nerve sensors with alarms specifically for problems like temperature or pressure. This begins the process
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of the most common type of pain signals. This is where nonsteroidal anti-inflammatory drugs, like ibuprofen, work to relieve pain. Narcotics, although more potent drugs, have little value here because the body does not build narcotic receptors at this level. Also effective at this level are:

• Local anesthetics or numbing medicine, like Novocain
• Warm or cold packs
• Massage and some muscle relaxants
• Transcutaneous Electrical Nerve Stimulation (TENS) and Alpha Stim (a refinement on TENS).

It is also at this cellular level that proper stump-wrapping and prosthetic fit work to limit discomfort. For example, stump-wrapping aids blood flow back toward the heart (venous return) and in the repair of interrupted blood vessels responsible for the “throbbing pain” patients describe when they first put their remaining limb over the bedside.

All medicines have side effects, and pain managers will often combine safer low-potency drugs with more-potent drugs to get the best combination of safety and effectiveness. For example, natural pain relief measures like massage, warm packs and physical therapy are combined with the right medicines to obtain safe and effective relief. The pain signal then travels from the tissue level up through the nerves to the spinal cord.

Mechanisms of pain - the spinal cord

The spinal cord carries all information to and from the brain, including the pain signals. In the process, the signal must cross nerve interconnections, or “synapses.” The alarm signal going toward the brain comes to the end of one nerve where it causes the release of chemical messengers. These attach to the end of the next nerve. This process continues the signal upward much like a voice is converted from sound waves to electrical signals and back to sound over the phone system. Despite this change, the message gets there if the nerves are intact.

The spinal cord has large numbers and many types of these chemical synapses, and at these sites, different drugs and the brain itself can influence the volume of incoming pain signals. To do this, the spinal cord includes narcotic receptors. Thus, narcotics can work on the spinal cord like they can when given in the vein. Obviously, administering a drug at the spinal cord level is far more complex than getting a shot in the arm. Such techniques are used only by specially trained nurse anesthetists and anesthesiologists under sterile conditions and almost always in a hospital setting.

Some drugs that were originally developed as antidepressants can also be helpful at this level. Although they are not in the same class as most pain relievers, they can help the body turn down the volume of the pain alarm without blocking normal body functions or causing numbness like local anesthetics, such as Novocain. Amitriptyline and trazadone are examples of this class of drugs.

Mechanisms of pain - the brain

In the brain, the alarm signal is filtered through such systems as memory and previous conditioning to become the feeling known as pain. The brain also has specialized sites where medicines and non-drug pain measures work to decrease suffering and affect how we react and cope with discomfort. Pain is a very subjective experience; everybody feels it and manages it differently. Also, pain and suffering are not synonymous. Some people seem to suffer very little from pain, while others suffer greatly from minor discomforts.

On the bright side

Authors have reported that patients with painful body parts before surgery experienced less PLP when aggressive pain relief measures were taken before surgery combined with effective sustained pain relief measures after surgery. This suggests that nurse anesthetists and anesthesiologists, through providing anesthesia and pain relief during initial recovery, may now begin to think in terms of preventing a lifelong pain problem.

Other articles have been printed in inMotion offering solid information about the treatment of pain, and health professionals in many specialties continue to explore and find new and better ways to manage it. For example, when a special kind of anesthesia drug called an NMDA blocker is given during surgery, it can lower a patient’s need for narcotics for days afterward without sacrificing effective pain control or causing sleepiness. We have also found that supplemental magnesium in the diet can help the body control its pain alarm mechanisms.

Toward a deeper understanding of phantom limb pain

Another finding has been how the pain pathways in the nervous system can actually change in response to unremitting pain. It appears that the presence of strong, long-lasting pain actually changes the body’s alarm receptors and causes them to become more sensitive - a phenomenon known as “wind-up.” In such states, usually silent pain receptors become active, and the area of the nervous system responsible for recognizing pain in that section of the body can become so sensitive that it can report pain alarm even though a pain signal might not be coming in, thus producing a phantom pain.

Do we have evidence for such changes? Yes. When the nerves are cut during amputation, some will attempt to regrow. They slowly form branches that sometimes reconnect to themselves forming a bundle of nerve tissue, or a neurona, which can become a “pain generator.”

The nervous system’s ability to adapt is a wonderful attribute that can help the body heal and keep going; however, in this one special case, that adaptability or “plasticity” can lead to ongoing discomfort. These new findings suggest that this plasticity associated with PLP might be caused by severe, sustained pain and that we might be able to limit this change if we aggressively manage the patient’s discomfort.

What can be done?

Preliminary evidence suggests that if we effectively control this pain response, we might be able to help patients heal with fewer
developing lifelong bothersome PLPs. I say “might be able to” because these are new concepts, and we are still learning about these systems, how the body adapts, and how to do a better job of controlling pain. More research needs to be done to confirm these findings and to discover better ways of helping the body turn down the alarm. Revisions of our ideas are not a failure of science or medicine, but they do show that anesthesia and medicine are constantly evolving and that new discoveries should make us reconsider our understanding of how the body works. For example, long ago, pain was thought to come from evil influences, and the heart was thought to contain our center of consciousnesses. We have come a long way since those times and searching for more of our body’s secrets will be an ongoing process.

We use the term “multimodal” to mean combining different types of drugs and techniques to relieve patients’ suffering. There are about six billion types of bodies on this planet, and it seems each one does things in a slightly different way. This implies that for pain control, like anesthesia, there is no one “right” formula for everybody. Your anesthetist or anesthesiologist will consider your medical history, list of medicines, allergies, laboratory results, reason for surgery, and local resources, among other factors, to make an anesthetic plan tailored just for you. Anesthesia and pain relief are not “one-size-fits-all” ideas.

As the real leader of your healthcare team, you should be as accurate as possible when talking with your anesthetist about pain and anesthesia. You should ask questions and request answers in terms that you can understand. Yes, these are busy professionals but it’s your body and you deserve to know what’s going on with it. You can be a better team leader if you have a clear understanding of why events happen and how things work.

Other members of your team

The talents of many specialists are combined to help you recover and learn how to enjoy life and prevent further pain problems. For example, physical and occupational therapists can help you get back up and strengthen body parts that now must work differently. In this way, you can prevent over-use problems and stress on remaining body structures, regain effectiveness and confidence, and prevent damage to unaffected body parts.

Psychological consultation to address the stress experienced by amputees can be very valuable before surgery; however, opportunities for such consultations before surgery are not always possible. Experienced amputee volunteers and support groups offer general reassurance and advice about stump and prosthesis care, along with less frequently addressed issues like post-amputation sexuality. Occupational therapists help amputee survivors maximize functioning and effectiveness as well as regain self-confidence. Spiritual resources have also been scientifically shown to aid the amputee in the journey from patient to survivor. Of course, your prosthetist can help you optimize your adaptive aids, walking and swimming prosthetics. These can also minimize dysfunctional postures and secondary stress on unaffected muscles and joints already under increased stress.

Conclusion

There is tempting evidence that the suffering from phantom limb pain may be decreased and perhaps even prevented in some cases. We will probably never be able to completely control how people’s bodies respond to injury and illness or expect a complete absence of pain; however, we may be able to do a better job.

Another helpful change would come from within the healthcare community. In most cases, your nurse anesthetist or anesthesiologist is informed of your case in time to plan for your anesthesia. Ideally, the pain and anesthesia teams would be consulted early enough to begin to use this new information to your best advantage.

We need to continue to study how our bodies work and how they reconfigure after injury and illness. Since the earliest days of human beings, when knocked down, we have picked ourselves up, dusted off and gone on. With new knowledge and tools, we are learning improved methods to help people do that very human thing - being a survivor.

About the Author

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