



Pushin' On is a publication of the University of Alabama at Birmingham Model Spinal Cord Injury System of Care and the **SPINALCORD** Injury Information Network.



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Reconstruction Surgery for Pressure Sores

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A **Pressure Sore** is an area of the skin or underlying tissue that is dead or dying as a result of the loss of blood flow to the area. The pressure occurs when a person rests on a bony area for a prolonged period of time. The extended pressure leads to a pressure sore.

Anyone can get a pressure sore. They occur in as many as 10% of all hospitalized patients, but it is estimated that up to 80% of individuals with spinal cord injury (SCI) will have at least one pressure sore during their lifetime.

There are four stages of a pressure sore.

Stage 1 - Damage is limited to the top two layers of skin, the epidermal and dermal layers. The skin is not broken, but there is redness that does not turn white when touched. A person with dark skin will also see a change in skin color, which may become darker, dry, flaky, or ashy. The area may be warmer than other areas, and there may be a change in the skin's texture.

Stage 2 - Damage extends beyond the top two layers of the skin to the adipose tissue. The skin is slightly broken. The sore appears to be an abrasion, blister or small crater.

Stage 3 - Damage extends through all the superficial layers of the skin, adipose tissue, down to and including the muscle. The ulcer appears as a deep crater and damage to surrounding tissue may be present.

Stage 4 - Damage includes destruction

of all soft tissue structures and involves bone or joint structures. Undermining of adjoining tissue and sinus tracts may be associated with these sores.

The Evaluation

Anytime you have a pressure sore, it is essential that you keep weight off of the area and contact your doctor immediately. Your doctor will evaluate your condition to determine your treatment options.

Common Names for a Pressure Sore

Skin Sore
Bed Sore
Pressure Ulcer
Decubitus Ulcer

You also need to be evaluated for proper equipment. You may need bedding with a specialized mattress or a change in your wheelchair cushion.

Stage 1 and 2 pressure sores are usually treated without surgery. Stage 1 treatment is almost always bed rest because it is essential to stay off the pressure sore to allow healing. Other treatments might include wound care, improving nutrition, pressure reliefs and exercises. Treatment for muscle spasms may be necessary to allow the wound to heal.

Surgery might be used for stage 3 and 4 pressure sores located on the sacrum (tailbone), ischium (beneath the buttocks), and trochanter (hips). Surgery may also be needed to treat sores that have not responded to non-surgical treatments, correct a previous surgical failure, remove infection from the hip

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joint, and prevent exposure of bone, plates or screws. Patients who are poor candidates for operations in general should not undergo surgery. For example, patients with a history of drug and alcohol abuse are not considered good candidates for surgery. The same is true for patients without adequate social support or appropriate equipment. Because smokers have a greater risk for skin flap failure and other complications, smokers are usually not candidates unless they stop smoking 8 weeks prior to surgery.

Antibiotic use for pressure sore infections can affect treatment and may change the plan for surgery. Infection is suggested by redness at the wound edge, foul odor, or discharge. An additional evaluation is required for medical problems that could complicate the surgery itself or reduce the body's ability to heal. These problems include such things as heart disease, blocked arteries, lung problems and diabetes.

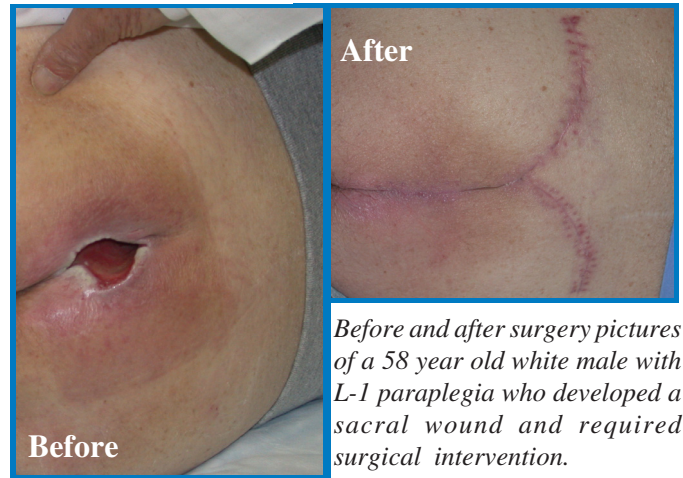
Surgical Treatment

There are many different types of surgeries used to treat pressure sores. Debridement is an option to surgically clean and remove any dead or infected skin and muscle. This debriding creates a larger wound, but the area is healthy and more likely to heal. In many cases a small amount of bone is also removed from the base of the wound to decrease recurrence of infection. In some cases, the hip joint will need to be removed along with a portion of the thigh bone.

Reconstructive surgery involves the removal of healthy tissue from one place on the body to cover a wound somewhere else. The skin and/or muscle (the flap) is usually taken from the back, buttocks or thigh. This flap tissue, which has a good blood supply, is repositioned to cover the wound and help nourish the tissue around the pressure sore. Once the pressure sore is covered, the area where the flap tissue was removed is closed. Sometimes skin grafts are used to close these areas.

Multiple Pressure Sores

Some people have more than one pressure sore. It is not uncommon that surgery on these areas must be spread out over more than one surgery. If reconstruction can be accomplished with a single operation, it may require a more radical treatment option if there are



multiple or very large wounds. In severe cases, a leg may be amputated to provide the necessary tissue for the reconstruction. For example, a total thigh flap requires amputation of the leg so the skin and muscle from the front of the thigh is used to fill the wound.

Postoperative Care

After surgery, it is very important take care of the repaired area to reduce the risk for complication. Care starts with transferring from the operating table to the air-fluid bed. Patients are positioned flat in the air-fluid bed for 4 weeks. Movement is limited to prevent shearing and tension across the flap repair. After 4 weeks, patients can be wedged carefully into the semi-sitting position. Six weeks after surgery, patients can begin sitting for 10 minute intervals. After each interval, the flap area is examined for discoloration and wound edge separation. The sitting periods are increased at 10 minute intervals over 2 weeks and reaching up to 2 hours of sitting at a time. Pressure reliefs are needed for 10 seconds at least every 15 minute while sitting. Patients will need to continue using a pressure-reducing mattresses and turn in bed every 2 hours.

Individuals with SCI have other concerns. Involuntary muscle spasms must be well controlled to allow proper healing after surgery. Bacteria, which is the source of infection, is easily brought into the bladder with Intermittent Catheterization, Foley, and Suprapubic

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Note

Dr. de la Torre is a UAB plastic surgeon and Associate Professor of Surgery. Dr. Oberheu is a former Assistant Professor of Rehabilitation Medicine and former Director of the Pressure Ulcer Clinic in the UAB Dept. of Physical Medicine and Rehabilitation.

HEALTHY LIVING

UNDERSTANDING NUTRITION - PART II

Q Why do I need to talk to my doctor before I change my diet?

A In general, most people with spinal cord injury (SCI) can benefit from a healthy diet and exercise program. However, everyone has unique health concerns. Your doctor can let you know how diet and exercise impact various medical issues (examples: diabetes, congestive heart failure, pressure sores and chronic pain). Your doctor can then make suggestions on managing those issues.

It is essential that you see your doctor every year because your body changes as you get older, which may mean you need to change or modify your diet and exercise programs. Plus, your doctor can keep track of your weight, blood pressure, and blood cholesterol levels. Yearly checkups can also help you identify medical problems early. For example, most people with SCI need a yearly renal scan to identify abnormal declines in kidney function.

Q Is it OK for me to go on a "low-carb" diet?

A Although there is no definitive research on this issue, it is believed that people with SCI are at higher risk for kidney problems when following a diet low in carbohydrates (low-carb). Without the proper nutrition, you are also putting yourself at higher risk for skin problems, urinary tract infections, and irregularities with bowel management.

Q What does my diet have to do with skin care?

A First, proper nutrition is essential to maintain a healthy weight. People who are too thin are at higher risk for pressure sores due to a lack of much needed "padding" between their bones and skin. People who are too heavy are also at higher risk because it is harder to do effective pressure reliefs, and they put added weight on boney areas such as hips, shoulders, elbows, tailbone or heels. Second, healthy eating habits can help maintain skin strength and enhance healing. Proper nutrition can help prevent swelling, which is

bad for skin circulation and compromises the process that gets oxygen to cells throughout the body.

Essential Nutrients for Maintaining Healthy Skin

Water helps keep skin moist and supple (elastic).

Proteins help maintain skin elasticity and help in wound healing.

Carbohydrates help your body utilize proteins.

Zinc is believed to promote wound healing (should not be taken in excess).

Vitamin A and **Vitamin C** promote wound healing.

Q How can my diet prevent cancer?

A While scientific evidence indicates inherited genes influence cancer risk, evidence also suggests about 1 in 3 cancer deaths in the U.S. are due to poor nutrition and physical inactivity. Although a high fat diet was once thought to cause cancer, it now appears that a high calorie diet is the culprit. Because many cancers are also associated with obesity and excessive food and alcohol intakes, adults can reduce cancer risk with a proper diet and exercise.

Phytochemicals are natural plant compounds that work as antioxidants or immune boosters to help protect you from developing cancer. Because it is not known if the protective benefits come from the individual phytochemicals or from the way they interact with nutrients in the foods, it is best to get phytochemicals from natural food sources (fruits, vegetables and whole grains) rather than supplements.

Isoflavones are specific types of phytochemicals that act as antioxidants, block enzymes that promote tumor growth, and can lower LDL (bad) cholesterol. Researchers believe a group of plant compounds found in soy protein, called phytoestrogens, includes isoflavones. Soy may help raise the beneficial HDL (good) cholesterol as well as reduce risk of some cancers. The recommended daily intake of soy protein is 25 gm, but research suggests that just one serving of a soy product daily can have health benefits. Some isoflavone rich natural food sources are soymilk and tofu.

Research For A Cure in SCI

by Amie B Jackson, MD

Spinal cord injury (SCI) research is often reported in the world news and circulated on the Internet. Much of the focus of information concerns the "promising breakthroughs" in the search for a cure. Because most scientists agree that it is only a matter of time before there is some form of cure for SCI, it is important to take time every few years to review advances that have made and the direction of strategies for a cure.

The Basics

The spinal cord is the thick bundle of nerves that carry sensations and messages to and from the brain and the body. The spinal cord is enclosed in the spinal canal, a bony passageway that is formed by the holes in the middle of every vertebra. The spinal column is made up of four regions, which include the 7 cervical vertebrae, 12 thoracic vertebrae, 5 lumbar vertebrae, and 5 sacral vertebrae that are fused to form the sacrum.

A spinal cord injury is damage to any of the nerves within the spinal canal. This means that an injury can affect sensation and movement of the whole body. The spinal cord may be injured if you have an injury to the neck or back that:

- 1 breaks or dislocates the bones around the spinal cord;
- 2 penetrates through or between the bones (such as a bullet); or
- 3 crushes the disks between the bones and pushes them into the spinal canal.

When the spinal cord is injured, a cascade of cellular and molecular events occur inside and around the damaged spinal nerves. This process starts immediately to destroys neurological function and can continue for weeks. This cascade of events essentially occur in sequence. This damage to nerve cells and blood vessels occurs at first in the center of the spinal cord and spreads outward. The sequence is below:

- ◆ swelling and bleeding;
- ◆ nerve cell injury from lack of oxygen;
- ◆ genes are turned on that make chemicals that further hurt and kill nerve cells;

- ◆ release of more toxic substances like free radicals;
- ◆ prolonged Inflammation;
- ◆ more free radicals and toxic substances are released;
- ◆ scarring;
- ◆ more cell death and neurological damage; and
- ◆ regrowth is blocked by scar tissue and by genes that produce substances that inhibit nerve growth.

Strategies

The eventual cure for paralysis will likely involve the use of one or more of four strategies for a cure. These basic strategies have not really changed over the last few years, but there have been a few advances in each area.

1 *Neuro-Protective Agents* are used to prevent or minimize the damage immediately after injury along with long-term scar formation. The current focus is first on developing precise surgical techniques at the injury site to stabilize and decompress the pressure around the spinal cord which allows for delivery of specific drug interventions. The second step is to develop more effective ways to deliver the drug directly to the nerve cells with the goal of improving neurologic outcomes.

To date, Methylprednisolone, GM-1 Ganglioside (Sygen), 4-Aminopyridine (4-AP), and Interleukin-10 have been studied. The use of Methylprednisolone after spinal cord injury is controversial. In general, studies suggest the drug is minimally significant at best. Yet, methylprednisolone continues to be widely used after injury. A multi-center study of Sygen has also shown mixed results. Specifically, one treatment subgroups had earlier recovery but no improved recovery over the long-term. Interleukin-10 and 4-AP offered no improvement in neurologic outcomes. Other drugs currently under investigation include Cyclohexamide, Gluamate (AMPA) Receptor Blockers, BAF, Hypothermia, and Opioid antagonists.

2 *Regeneration* centers on manipulating the neural environment to facilitate nerve growth. Possible growth factors include Neurotrophin-3 (NT-3), Brain Derived Neurotrophic Factor (BDNF), acidic Fibroblast Growth Factor (aFGF), and Nerve Growth Factor (NGF). Electrical stimulation, transplant glial or schwann cell grafts may be considered. Regeneration also requires the ability to block the inhibitory processes that prevents

spinal nerve growth, which might be accomplished by the Inhibitor-Neutralizing antibody (IN-1 Antibody). Finally, it is necessary to promote correct "connections" on both sides of the injury. This might be accomplished with Olfactory-Ensheathing Glial Cell implants, Growth Cones and Neural Glue, Netrins (substance produced by nerves which forms a structure on which new nerves will grow), and/or Schwann Cell Tubes (allows nerves to grow through the tube to the other side of the injury).

3 *Transplantation* is a repair strategy. The four components of transplantation include multiple peripheral nerve bridges, grafted areas with fibrin-based tissue glue, the addition of growth factors (aFGF), and stabilization of the spine to prevent re-injury. Transplantation types include peripheral nerves, fetal central nervous system tissue, stem cells, and genetic induction (genetic material in the form of viral or plasmid vectors deliver genes into surviving cells in the spinal cord which induce stem cell and neural tissue growth).

4 *Rehabilitation* interventions are essential to help people regain and maintain strength, stamina, and balance once function is restored. Today, interventions include bioengineering, computerized, and advanced therapeutic techniques. Functional Electrical Stimulation (FES) is a likely treatment option to improve limb, bladder, bowel and respiratory functions. Other interventions might include surgical techniques to enhance regeneration and axonal sprouting (plasticity) to improve communication between the brain and body.

Participating in Research

Whenever you hear about "promising" research, it is very important to consider the sources of information before making a commitment to participate in research. Most researchers in the United States (US) follow strict guidelines for conducting research that are designed to protect participants from harm. US researchers also gain credibility for their results by publishing them in peer-reviewed journals. This process helps assure the

public that results from research are based on credible evidence. On the other hand, researchers from other countries may not be subject to US standards. This means such researchers can claim achievements in research without offering supporting evidence.

Researchers from around the world are recruiting individuals with SCI to participate in clinical trial to determine the effectiveness of various treatments. The list below includes the treatment being studied, the time frame post-injury when treatment is administered, and the ones conducting the clinical trials.

Current Clinical Trials

<u>Treatment</u>	<u>Time Post-Injury</u>	<u>Investigator(s)</u>
NMDA	within 3 hours	France
Nogo Protein	within days	U.S., International
Minocycline	within days	Canada
Activated Macrophages (ProNeuron)	within days	U.S., International
Oscillating Electromagnetic Field Stimulation	within days	U.S.
BioAxone	within 7 days	Canada
Polyethylene Glycol	within months	U.S.
4-AP	after 1 year	U.S., International
HP184	after 1 Year	U.S., International
Autologous Sural Nerve Transplants	after 1 year	Brasil
Fetal Olfactory Cells Transplant	after 1 year	China
Adult Olfactory Cells Transplant	after 1 year	Portugal and U.S.
Umbilical Cord Blood Intrathecal Infusion	after 1 year	Korea

Summary

In the end, it is likely there will be different treatments for a cure. Right now, re-myelination seems to be the simplest repair process to accomplish. It also seems easier to find a way to prevent or limit the early injury cascade than it is to reverse the damage. You can expect answers to other questions to be determined by current and future research results.

Note

This article is based on a conference lecture presented by Dr. Jackson to consumers with spinal cord injury on July 11, 2005 at UAB Hill University Center.

RESEARCH UPDATE:

Treating Spinal Cord Injury Pain with Cranial Electrotherapy Stimulation

This study is sponsored by the Veterans Administration. Spain Rehabilitation Center at the University of Alabama at Birmingham is being paid by the sponsor to conduct this study. Dr. Scott Richards is Principal Investigator.

Background

Many people with spinal cord injury (SCI) have chronic neuropathic (the nervous system) pain at or below the level of normal feeling that often interferes with daily activities and reduces their quality of life. Cranial Electrotherapy Stimulation (CES) is a treatment that sends a very small amount of electric current to the head through ear clips electrodes. CES has been found useful in controlling anxiety, depression, sleep problems, and generalized stress. A recent study found that the amount of pain decreased in people with SCI who received actual CES treatment as compared to pretend CES treatment (no current was flowing). Larger studies of the effectiveness of CES for treating specific types of chronic pain in persons with SCI are needed.

Objective

The purpose of this research study is to assess the effectiveness of CES in treating chronic neuropathic pain at or below the level of injury in persons with SCI.

Participants

University of Alabama at Birmingham is 1 of 5 facilities recruiting a total of 172 study participants who have neuropathic pain after SCI.

Methodology

Qualified participants are randomly assigned to either a control group (receiving no actual current) or a treatment group (receiving 100 microamperes sub-sensation CES). All participants will complete an initial questionnaire. A Research Coordinator will then teach participants to use a CES device and maintain a Daily Pain Rating Sheet to measure the amount of pain just before and just after each treatment session. Participants will take a CES device home and use it for the next 21 days for one hour per day. The Research Coordinator will conduct weekly telephone interviews to identify and correct any problems including any side-effects.

After the 21 days of treatment are completed, participants will return the CES device and complete another set of questionnaires.

Participants will also be given the chance to take part in a six-month follow-up. They will be told to use the CES device whenever they want but will still be asked to fill out a Pain Rating Sheet before and after each session. The Research Coordinator will call participants each month to identify and correct problems. At the end of three and six months, participants will complete a set of follow-up questionnaires either in person or by telephone to determine your satisfaction with the CES device. At the end of six months, participants will be asked to return the CES device.

Potential Benefits

This treatment is experimental. Although participants may not personally benefit from this research, participation may provide valuable information to the medical community about whether or not CES is effective in reducing pain.

Participation Incentives

There is no cost to you for participating in this study except for the cost of transportation to the medical center. The CES device will be loaned to you at no cost. You will, however, receive a \$25 gift card for completing the pre-intervention questionnaire and another \$25 gift card for completing the post-intervention questionnaire and returning the device and all the rating forms. If you take part in the 6-month follow-up phase, you will receive a \$10 gift card after completing the 3-month questionnaire, and another \$10 gift card after completing the 6-month questionnaire and returning the device and rating sheets.

Note

UAB Spain Rehabilitation Center will enroll as many 35 participants. For information on participating in this study, contact Sherry Sutphin at 205-996-5014 or ssutphin@uab.edu.

methods of bladder management. It is important to prevent infections, and antibiotic treatment is needed if bacteria are present in urinary cultures or urinalysis.

Special equipment is also needed to allow healing to progress normally. Because this is so important, all equipment are secured before surgery is scheduled. The equipment might include a pressure-reducing mattress (such as an air-fluidized bed or low air loss mattress) and a proper seat cushion for patients using wheelchairs. In addition, plans for recovery include setting up home health care or staying in a rehabilitation facility or assisted living center to recover.

In most cases the area of the pressure sore and reconstructive flap does not have sensation. It is also important to note that reconstruction cannot restore normal sensation. Wound disruption or delayed wound healing is possible, and some areas of the flap skin may heal abnormally or slowly.

Without these precautions, wound breakdown or pressure sore recurrence is extremely likely. Treatment may require frequent dressing changes or further surgery to remove the non-living tissue and an additional reconstructive procedure.

Risks of Flap Reconstruction

Every surgical procedure involves a certain amount of risk, and it is important that you understand the risks involved with the reconstruction of a pressure sore. An individual's choice to undergo a surgical procedure is based on the comparison of the risk to potential benefit.

Although the majority of patients do not experience the following complications, you should discuss each of them with your surgeon to make sure you understand the risks, potential complications, and consequences of reconstruction with flap surgery.

Bleeding is possible during or after surgery. If bleeding occurs, it may require emergency treatment to drain accumulated blood (hematoma).

Infection can occur after surgery. Should an infection occur, treatment including antibiotics or additional surgery may be necessary. If an infection does not respond to antibiotics, the reconstruction may be opened. After the infection is treated, additional reconstruction may be needed.

Flap Failure is possible despite all best efforts. Failure sometimes occurs when a blockage or compression occurs at the point of blood flow to the flap.

Even though risks and complications occur infrequently, the risks cited above are the ones that are commonly associated with flap reconstruction surgery. Other complications and risks can occur but are uncommon. Should complications occur, additional surgery or other treatments may be necessary.

Every pressure sore is unique, and a great deal depends on individual circumstances. Ask your doctor to explain anything you do not understand. Also, you should also ask your doctor for educational information that specifically details the procedure you are considering for yourself.

The *EatRight® Home-Based Weight Management Program for Individuals with Spinal Cord Impairments* was created to meet the unique nutritional and physical needs of persons with spinal cord injuries, dysfunctions and diseases. In a pilot study, the program was shown to be safe and effective for weight loss, reducing medical risks and improving quality of life. This comprehensive program utilizes video lessons and workbook assignments to guide you through the 12 proven elements of effective weight management:

1. Getting Started
2. Making Healthy Food Choices
3. Planning Meals

4. Shopping
5. Cooking
6. Setting Goals
7. Participating in Physical Activities
8. Dining Out
9. Understanding Nutrition
10. Improving Self-Talk
11. Reducing Stress
12. Maintaining Long-Term Success



For more information or to order this program, go to www.spinalcord.uab.edu/show.asp?durki=77527 or call 205-934-3283

Participants Needed for Study on Chronic Pain and Spinal Cord Injury. Participants with chronic pain (meaning at least the last 6 months) are being asked to complete a 1-time, 45-minute telephone survey on the contribution of cognitive appraisal, coping, activity restriction, and social support in the relationship between pain and depression. Participants get \$25 for completing the survey. Contact Michael Wilson *toll free* by phone at 877-686-5300 or email at mwwilson@uab.edu to see if you qualify.

Are you a person with nerve (neuropathic) pain after spinal cord injury and a smoker? If you are, UAB's Spain Rehabilitation Center is interested in talking with you! UAB is considering a research project to study to determine whether or not there is an association between smoking and neuropathic pain after spinal cord injury. Contact Sherry Sutphin at 205-996-5014 or ssutphin@uab.edu.

UAB's Spain Rehabilitation Center is looking for women with spinal cord injury who are 5 years post-injury, T-10 level or higher, using a wheelchair for primary mobility, at least 2 years postmenopausal, not on any hormone replacement therapy, and without a history of rheumatology or malignant bone disorder, chronic steroid use, or parathyroid, thyroid or pituitary disorder. Such women can participate in a study on postmenopausal complications and early and appropriate interventions such as medications, dietary management, injury level specific exercise protocols and equipment and wheelchair modifications to address whether or not women with SCI need early prophylactic therapies soon after injury to delay or lessen the later effects of menopause. Participates get transportation costs, \$50 per visit to Spain Rehabilitation Center, and free medical examinations, which includes a bone density scan and follow-up. Contact Pat Taylor at 205-934-5463 or poharet@uab.edu to see if you qualify.

✧ WEB PAGES ✧

Pressure Sores

- ✧ www.pva.org/pvastore
- ✧ www.craighospital.org
- ✧ www.spinalcord.uab.edu
- ✧ depts.washington.edu/rehab/sci



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Research for Cure

- ✧ www.iom.edu/project.asp?id=14986
- ✧ www.themiamiproject.org/x927.xml
- ✧ www.miamiproject.miami.edu/x26.xml
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- ✧ clinicaltrials.gov/ct/search?term=spinal+cord+injury
- ✧ www.urmc.rochester.edu/pr/news/story.cfm?id=597
- ✧ www.cryo-cell.com/news/subpage_noad.asp?ID=158
- ✧ www.news.harvard.edu/gazette/2004/03.25/01-spinalcord.html
- ✧ www.eurekalert.org/pub_releases/2004-02/uow-scf021704.php

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Resources

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- ✧ spinal.siteutopia.net
- ✧ www.reeve.uci.edu
- ✧ spinalcordtrial.com
- ✧ spine.wustl.edu

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