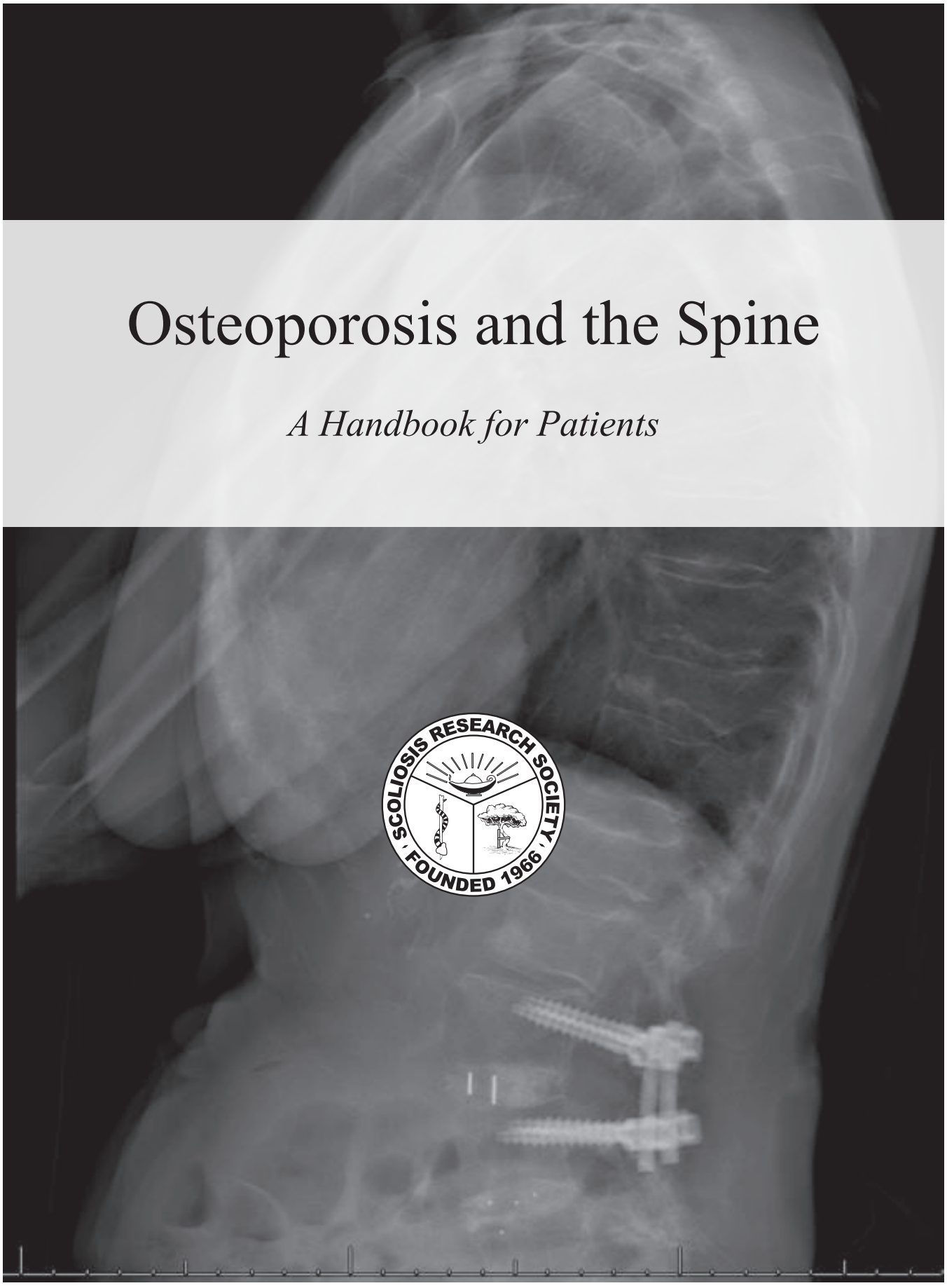
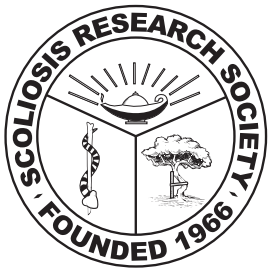


Osteoporosis and the Spine

A Handbook for Patients

SCOLIOSIS RESEARCH SOCIETY
FOUNDED 1966



Scoliosis Research Society
Dedicated to Education, Research and Treatment of Spinal Deformity
555 East Wells Street, Suite 1100
Milwaukee, WI 53202
Phone: (414) 289-9107 | Fax: (414) 276-3349
Email: info@srs.org

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Preface

The Scoliosis Research Society's Patient Education Committee has prepared this booklet to provide patients with a better understanding of osteoporosis and the spine. This information is intended as a supplement to the information your physician will provide. It is beyond the scope of this booklet to discuss technical aspects of all the various surgical procedures that may be needed, but general concepts are discussed.

It is not intended that the contents of this manual be interpreted as standards or guidelines proposed by the *Scoliosis Research Society*.

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What Do Our Bones Look Like?

Our body is made up of different types of tissues including organs (like the heart and lungs), bones (like the thigh bone and arm bones), and cartilage. The skeleton of our body is made up of different types of bones. Bones themselves have a complex structure and are made up of two kinds of bone: cortical and trabecular. Cortical bone makes up 80% of our skeleton and is the hard outer shell of bone that gives the skeleton support. Trabecular bone makes up 20% of our skeleton and is the softer bone inside the cortical shell. Cortical bone is dense and solid, whereas trabecular bone is more brittle and is surrounded by bone marrow inside. *(Figure 1)* Different bones have different mixtures or ratios of cortical to trabecular bone. The bony blocks of the spine (vertebrae) have a 1 to 3 ratio of cortical to trabecular bone, while the hip has a ratio of 1 to 1.

fig.1

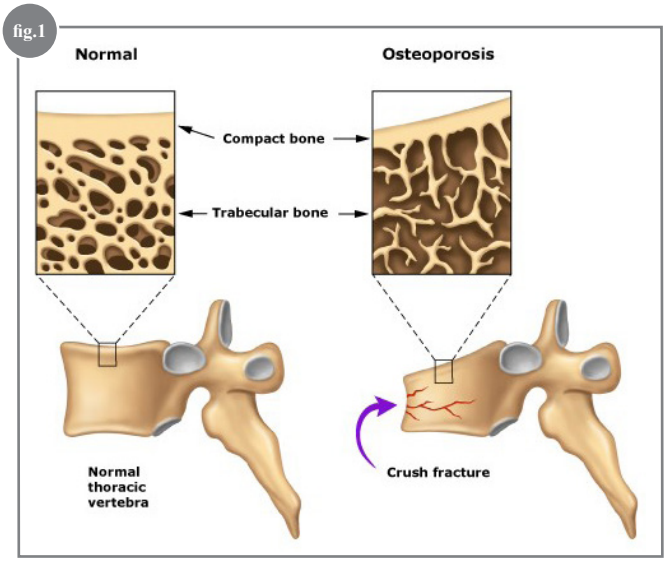

Figure 1:

Schematic comparison of normal and osteoporotic bone showing thinning of the trabecular.

What is Osteoporosis?

fig.2

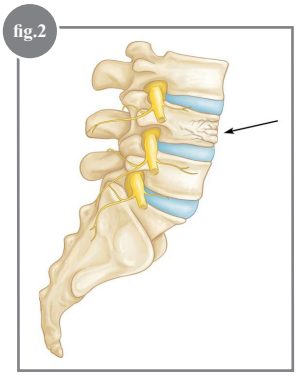

Figure 2:

A vertebral compression fracture occurs when too much pressure is placed on a weakened vertebra leading to the front of the vertebra, arrow to crack and narrow.

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Osteoporosis is a condition where the density and quality of the bone are reduced. Bones become more porous and fragile. As the bone becomes more fragile, the risk that the bones will break increases. *(Figure 2)* Osteoporosis can occur in all the bones of the skeleton, but is most common in the hips, the wrist and the spine. More than 1.5 million fractures in the United States each year are caused by the weakening of bones due osteoporosis.

What Causes Osteoporosis?

Bone is alive and constantly changing. Every minute, bone is being made by cells called osteoblasts and removed by cells called osteoclasts. Osteoporosis is caused by an imbalance between these cells, where too much bone is taken away or not enough is made. This imbalance can result from how the cells are programmed by its genes.

The main factors that can lead to osteoporosis include aging, heredity, nutrition and lifestyle, and medications and other illnesses. Everyone loses bone with age. In general, the older you are, the lower your total bone mass and the greater your risk for osteoporosis. *(Figure 3)* Osteoporosis can run in families and can be inherited. Alternatively, osteoporosis can come from how the bone cells react to certain chemicals or medicines that enter your body. Constant use of steroid and seizure medications are common causes of osteoporosis. Smoking and alcohol abuse are also leading causes of osteoporosis in men.

fig.3

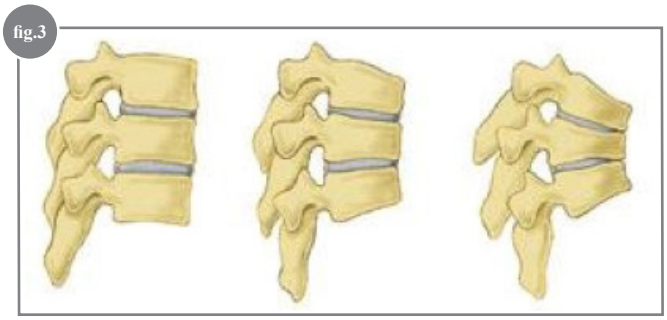

Figure 3:

Vertebrae showing the progression of osteoporosis. Normal vertebrae (left), vertebrae with mild osteoporosis (center), and vertebrae with severe osteoporosis (right).

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What Are the Signs of Osteoporosis?

Osteoporosis is a silent disease. There are no early symptoms and the diagnosis is usually made after the bones becomes fragile and break. A vertebral compression fracture occurs when too much pressure is placed on a weakened vertebra leading to the front of the vertebra to crack and narrow. *(Figure 4)* This can happen from minimal trauma like falling down while standing or in severe cases, from coughing or sneezing.

fig.3

Figure 4:

X-ray of a vertebra that has narrowed, losing its usual rectangular shape.

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Osteoporosis will often cause a loss of height and can cause a severely rounded upper back, called kyphosis. *(Figure 5)* Osteoporosis can also lead to curving of the spine from side to side, called scoliosis. It can even cause sudden, severe back pain due to a fracture.

fig.5

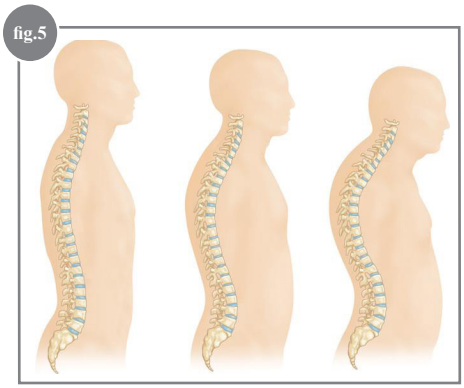

Figure 5:

As osteoporosis progresses, the vertebrae weaken and can cause a severely rounded upper back, called Kyphosis.

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What Can One Do to Prevent Osteoporosis or Stop it From Getting Worse?

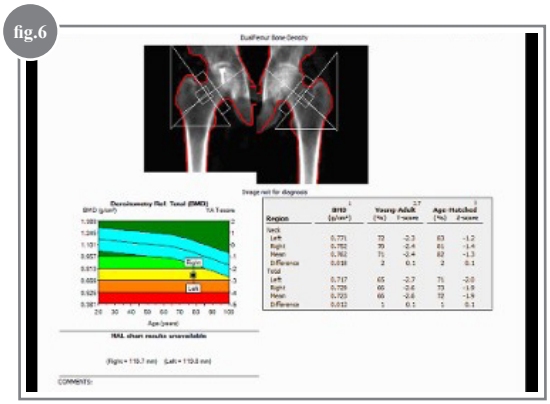
Exercise and a daily intake of calcium with vitamin D are important. Aerobic and resistance exercise that puts weight on the bones of the legs and spine is critical and should be performed at least 3-5 times per week. Exercise improves both the bone and the muscle strength and it helps in maintaining balance to prevent falling.

Calcium is best obtained in its natural form from milk, cheese or yogurt products. The daily recommended calcium dose for men is 1000mg, while for women it is 1200mg. Specific foods such as fatty fish are an excellent source of Vitamin D. Although several foods are fortified with Vitamin D, such as orange juice and cereals, these foods by themselves usually do not provide enough Vitamin D to meet your daily needs. For adults between the ages of 19 to 50 years of age, 600 IU of vitamin D a day is recommended. For women over 70 years of age, 800 IU of vitamin D a day is recommended. Based on your age and gender, your doctor can make specific recommendations on how much calcium and Vitamin D should be taken daily.

How is Osteoporosis Diagnosed?

A Dual-Energy X-ray Absorptiometry (DEXA) scan is the test of choice for diagnosing osteoporosis. This test uses X-rays to measure the density, or compactness, of a patient's bone and compares it to the average value for a young adult. A "T" score is calculated, a normal T score is greater than -1.0. Osteopenia, thinning of the bone, is diagnosed when the T score is between -1 to -2.4 and osteoporosis is diagnosed when the T score is -2.5 or lower. *(Figure 6)*

fig.6



Additional blood tests looking at vitamin D are also very helpful, as low levels of vitamin D are linked to osteoporosis and back pain. Your doctor may order additional blood or urine tests to determine the exact cause of osteoporosis and may make specific treatment recommendation based on those test results.

How is Osteoporosis Treated?

Because lost bone cannot be replaced, treatment for osteoporosis focuses on the prevention of further bone loss. Exercise and nutrition plans are often key components for the management of osteoporosis; however, there are other recommendations for the treatment of osteoporosis as well.

Pharmacologic Therapy for the Treatment of Osteoporosis and Osteopenia

The National Osteoporosis Foundation has specific recommendations for the diagnosis and treatment of osteoporosis. There are two major categories of medications used to treat osteoporosis: those that prevent bone from being broken down by the body's cells (bone resorption) and those that improve the body's ability to make bone (bone formation).

Bisphosphonates are a commonly used type of drug for osteoporosis that stops the resorption of bone. Drugs in this category include alendronate, risedronate, ibandronate, and zoledronic acid. The most common side effects, seen in up to 3% of these patients, are heartburn and abdominal pain. Rare side-effects from bisphosphonates given in high doses are collapse of jaw bones and fractures of the femur in places other than the hip. Bisphosphonates can also affect how your kidneys function, so blood work to check your kidneys is performed before starting these medications.

Other medications that prevent bone resorption include estrogen replacement therapy (raloxifene), calcitonin, and denosumab. Denosumab is the newest agent and stops bone resorption by stopping the development of cells that resorb bone. Denosumab can only be administered if a patient has normal calcium and vitamin D levels.

Teriparatide is the only medication available in the United States that improves bone formation. Teriparatide works by mimicking your natural parathyroid hormone and is given through daily subcutaneous injections that can be given by the patients themselves. This drug is limited to a single 2-year course of therapy in a lifetime. Teriparatide has been shown to increase bone density two to three times more than the medications that affect bone resorption. Studies also show that teriparatide decreases fractures in patients with osteoporosis.

The treatment methods mentioned above all offer patients with osteoporosis an opportunity to not only increase bone mass, but also to significantly reduce fracture risk. Prevention is preferable to waiting until treatment is necessary.

What to Do?

- Speak to your doctor
- Follow a healthy balanced diet with protien and calcium
- Exercise regularly

Where Can I Get More Information?

The best information about your specific condition typically comes directly from your surgeon. You can check to see if your surgeon is a member of the Scoliosis Research Society (SRS) by going to http://www.srs.org/find/. Membership in SRS indicates that at least 20% of the doctor's practice is in spinal deformity, that they attend annual meetings, and stay abreast of new information and new research.

In addition to the Scoliosis Research Society's website (www.srs.org), there are other reputable organizations and resources that may offer further information about your particular case.

Here is a list of some patient resources that may be of assistance:

- orthoinfo.aaos.org/ – American Academy of Orthopaedic Surgeons
- www.nih.gov – National Institutes of Health
- www.srs.org/patients-and-families/patient-brochures - SRS Patient Handbooks
- http://etext.srs.org/ – SRS provides information through the E-Text as an educational service. E-Text material is not intended to represent the only, or necessarily the best treatment for the medical situation's discussed, but rather is intended to present an approach, view, statement or opinion of the chapter author(s) that may be helpful to others who face similar situations. SRS disclaims liability for all claims that may arise out of the use of techniques demonstrated therein by such individuals.

Your Support Can Change the Lives of Others with Spinal Deformities

Please consider a donation to SRS.

100 percent of all contributions and donations to the Scoliosis Research Society's (SRS) Research, Education Outreach (REO) Fund are used entirely for research, outreach programs, and educational scholarships and fellowships seeking improved treatments, the causes and possible prevention of spinal deformities. Operating funds for SRS come from membership dues, educational meetings and courses, publication sales and other sources.

With your support, SRS can continue to support and offer necessary educational opportunities, beneficial research grants and maintain effective advocacy efforts that will change the lives of those living with spinal deformities.

If you would like to make a donation to the Scoliosis Research Society, please fill out the form below and mail it to:

Scoliosis Research Society
555 East Wells Street, Suite 1100
Milwaukee, WI 53202-3823 USA

Please make checks payable to Scoliosis Research Society.

If you would like to make your donation online, please go to
http://www.srs.org/professionals/research-and-journal/donate

YES! I would like to donate to the Scoliosis Research Society (SRS) to help continue in fulfilling its mission to improve the lives of patients with spinal deformities!

Enclosed is my gift of: ☐ $10, ☐ $20, ☐ $35, ☐ $50, ☐ $100, ☐ $150, ☐ Other _____

This gift is (in honor/in memory) of _____

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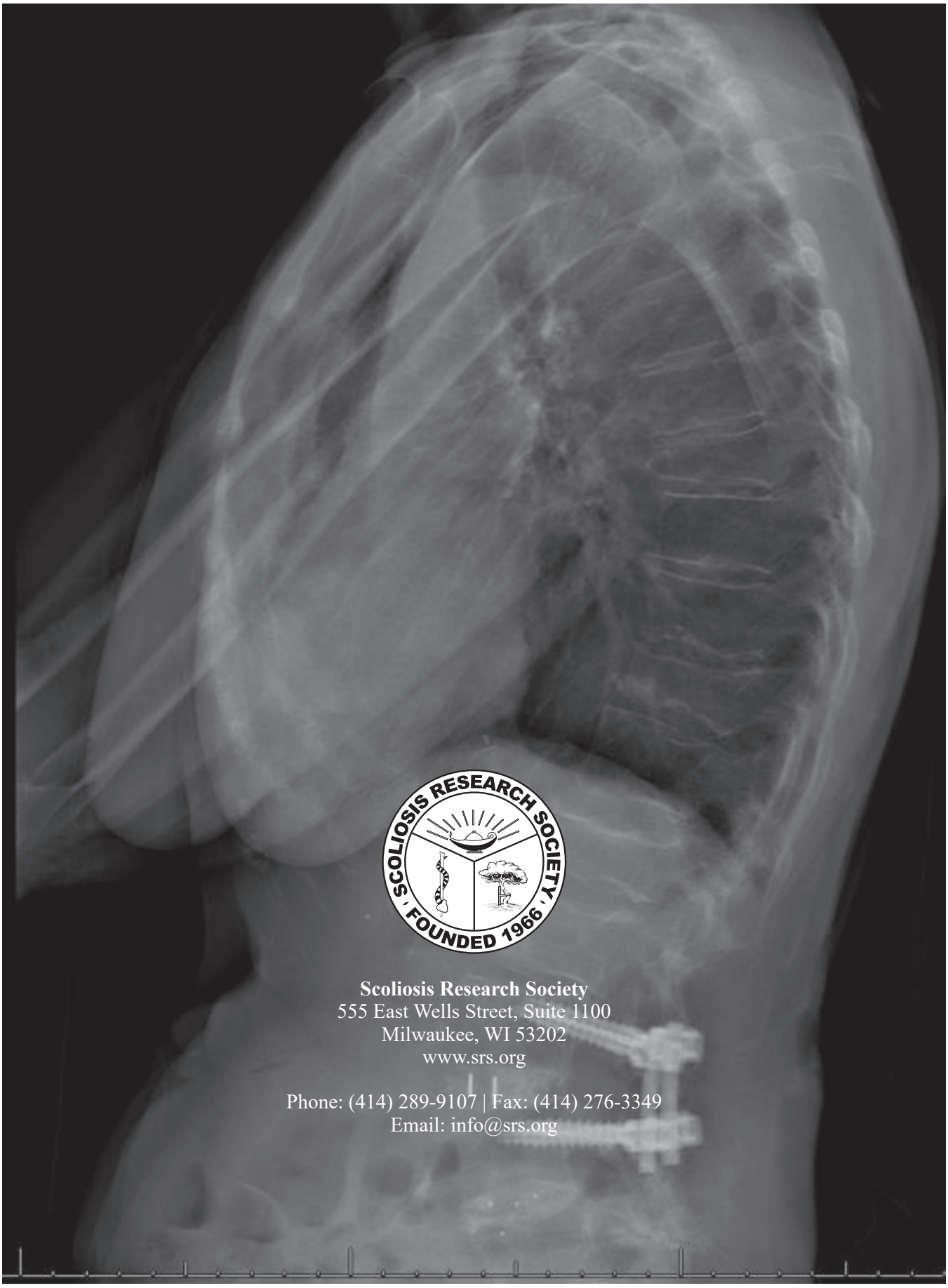

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Milwaukee, WI 53202
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