



Current Trends And Future Directions In The Treatment Of Idiopathic Scoliosis



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The treatment and evaluation of the patient with scoliosis has evolved dramatically over the past 50 years. This article will serve as a review of recent trends and future directions in evaluation and treatment of the patient with idiopathic scoliosis. Surgical techniques have evolved from the days of placing the patient in a body cast requiring up to six months or even longer on bed rest, often with repeat surgeries resulting in marked residual deformity, back pain, and high rates of pseudoarthrosis (non-fusion of the spine). Today, the majority of patients with idiopathic scoliosis in the adolescent population, the most common group, are treated with posterior (from the back) spinal instrumentation using pedicle screws. This has evolved from use of the Harrington rod construct in which two hooks were placed, one at the top and one at the bottom of the curvature. This was followed later by Luque wiring of the spine, and then by segmental hook constructs, which afforded better corrections and the ability for the patient to recover in the postoperative period without a cast or brace. The advantage of the segmental (multiple hook) instrumentation is that it also did a better job of preserving the sagittal (side) plane. The earlier instrumentation often resulted in loss of normal sway (lordosis) in the lower back and caused a syndrome called flat back syndrome. This is often corrected

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by pedicle subtraction osteotomy, a realignment procedure (see Figure 1). Current fixation using pedicle screws has been shown to be the best form of fixation resulting in maximum correction of the scoliosis in 3 dimensions and more rapid return to activities (see Figure 2). Typically, the patients may get back to full activities as soon as three months following surgery. It is common now to perform selective fusions in which only the structural curves are treated and secondary non-structural curves are allowed to spontaneously correct. This results in preservation of motion and function.

Simultaneously with the advances in posterior instrumentation, has been the utilization and development of anterior approaches. Thoracolumbar curvatures have been well addressed with the use of dual rod instrumentation, achieving correction and maintaining the sagittal plane (see Figure 3). Concerns of impact on pulmonary function (breathing dynamics) have not been found in a number of studies. A number of surgeons have been active in the development of the thoracoscopic approach for thoracic curvatures, which offers a number of advantages including small incisions, better restoration of thoracic kyphosis, than with pedicle screws, and excellent outcomes as noted by the SRS 24 outcome questionnaire. We have published recently on the results of this technique.

The thoracoscopic technique has in large part, however, given way to the posterior technique using pedicle screws as the patients tend to get back to full activities sooner. We are now beginning to approach the patients with posterior surgery with less invasive techniques resulting in less muscle disruption, earlier discharge from the hospital, less blood loss and transfusion requirements, and excellent correction of the spinal deformity. These techniques remain to be studied. They have been utilized very effectively in trauma to mobilize patients out of bed in the trauma setting very early and a number of centers have begun to utilize the techniques in scoliosis. The main concern about this technique is the ability to achieve solid fusions with this procedure.

The outcomes of various techniques are studied carefully using the SRS 24 or 22 outcome questionnaire. This questionnaire assesses the patient's response to their

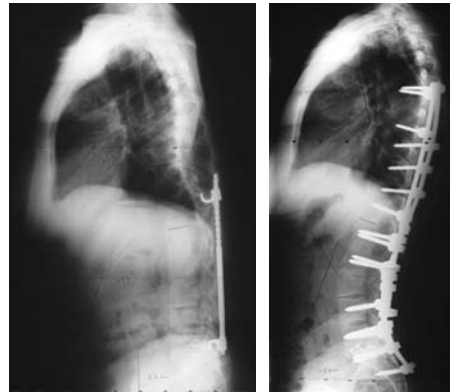


FIGURE 1
Loss of sway (flatback syndrome) Post-correction

scoliosis condition and to their treatment. The survey assesses the patient's view of his or her problem rather than the physician's perception of the patient's condition. The questionnaire evaluates activity level, pain, self image, mental health impact of the condition as well as their satisfaction with treatment. We are in the process of developing and validating a new outcome instrument termed the BIDQ-S, the body image dysmorphic questionnaire modified for scoliosis. The purpose of this is to evaluate the psychological impact of scoliosis and other spinal deformities on the patient.

New implant materials are beginning to be utilized in the treatment of scoliosis.

Titanium screws offer the advantage of better postoperative imaging with MRI or CT scan as compared to stainless steel screws and rods, which cause visual artifact and difficulty in reading postoperative images. These screws have been combined recently with the use of cobalt chrome rods, which are very strong and may allow for superior correction in the coronal and sagittal planes, doing a better job of restoring kyphosis. In a recent study, kyphosis has been shown to correlate with lumbar lordosis below, which is likely to be important in the long-term health of the lower back in a scoliosis patient. Cobalt Chrome rods are more image compatible than stainless steel and hold out the prospect of being more resistant than stainless steel against infection.

In the diagnostic realm, we have begun to study the use of upright MRI as an alternative to x-rays in patients with mild to moderate curves so as to avoid the radiation associated with x-rays (see Figure 4). We have early results of the use of upright MRI indicating good correlation with x-ray evaluation. This will require further study. A dramatic new development in scoliosis evaluation and prognosis has been that of a new genetic test, Scolio Score, developed by the Axial Biotech Company. This is a test in

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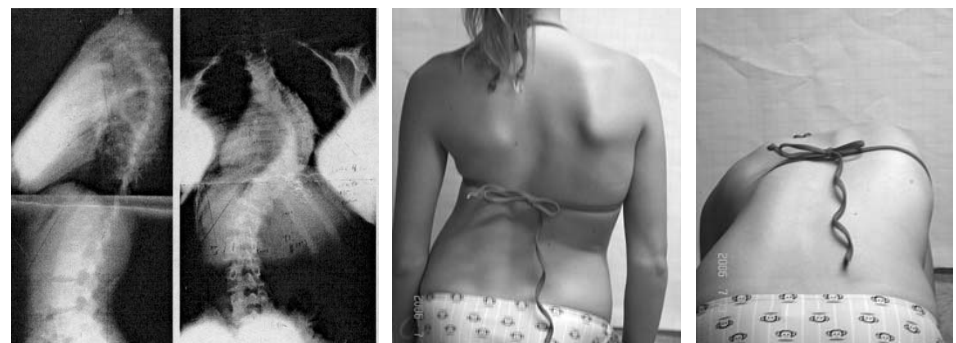


FIGURE 2 – Pre-op



FIGURE 2 – Post-op

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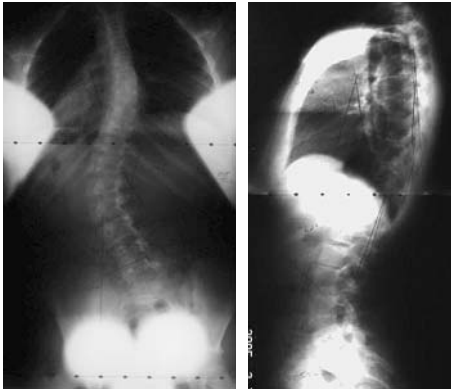


FIGURE 3
Pre-op

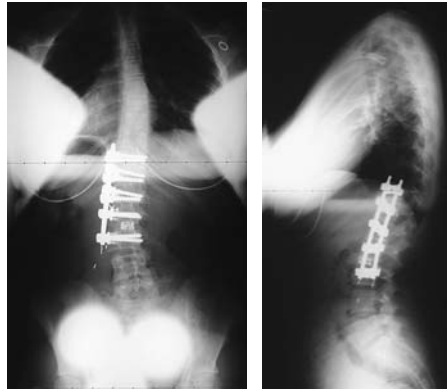


FIGURE 3
Post-op

which DNA samples are obtained from the patient's saliva and given a score, which determines the likelihood that a curvature will progress to over 40 degrees, potentially requiring surgery. This is applied to girls who have small curves up to 25 degrees and are between ages 9 and 13. At the moment, the test is restricted to this relatively small group and is not available for all races, as the data is not complete as of yet. The test promises to change the way in which specialists treat patients with small curves. For example, if they have a very low score, patients have a low likelihood of curve progression and the time between office visits and x-rays would potentially be decreased significantly. On the other hand if the patient has a very high score, initiation of bracing or other potential treatments would be done sooner so as to have a better chance of avoiding fusion surgery. Along this line, new techniques are being developed including spinal tethering or growth modulation. Stapling has been used on the curved side of the spine in order to guide growth, but is not a fusion procedure, allowing preservation of motion as well as growth. Newer techniques

are being developed to tether the spine using screws and cables, and this will be studied in the near future through a number of centers including my own. The growth tethering techniques will utilize thoracoscopic and minimally invasive approaches on the convex side of the curves to guide growth, with the aim of achieving gradual correction of moderate scoliosis without spinal fusion or external bracing.

The future of scoliosis care is highly promising. Techniques will continue to evolve gradually over time with the desired goal of optimizing function while maintaining patient satisfaction.

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FIGURE 4