

Retrospective Analysis of 52 Cases of Scoliosis Surgery in the Central-West Region of Brazil

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Abstract

This retrospective study analyzed 52 patients who underwent scoliosis surgery between 2014 and 2023 in private hospitals in the Central-West region of Brazil. The objective was to evaluate the degree of curvature correction, using the Cobb method, and postoperative complications. The sample was predominantly female (86.6%), with a mean age of 16 years. The majority of patients (92.3%) were diagnosed with idiopathic scoliosis (IS), with 57.7% presenting thoracic curves and 34.6% presenting lumbar curves, according to the Lenke classification. The average preoperative Cobb angle was 55°, with a postoperative average correction of 74%, reflecting the effectiveness of spinal arthrodesis techniques with pedicle screws. There were no neurological complications, but significant bleeding was observed in three cases, and revision surgery was required in two patients due to postural decompensation. These results are consistent with recent advances in scoliosis surgery, including the use of intraoperative neurophysiological monitoring and more sophisticated instrumentation techniques, such as the Cotrel-Dubousset system. Although highly effective and safe, complications such as blood loss and postural decompensation can occur, requiring continuous monitoring and corrective interventions. This study reaffirms the importance of modern surgical approaches and the high demand for treatment in the region.

Introduction

Scoliosis is a three-dimensional deformity of the spine characterized by a lateral curvature, vertebral rotation, and associated thoracic deformity. It is one of the primary causes of orthopedic deformities in adolescence and young adulthood. Scoliosis can be classified as idiopathic, congenital, or neuromuscular, with idiopathic scoliosis (IS) being the most prevalent, accounting for up to 80% of cases in adolescents [1,2]. Surgical treatment is recommended when the curvature exceeds 45-50° or when functional and respiratory impairment occurs, and it is frequently employed in severe cases of IS [3].

In recent years, significant advances have been made in scoliosis instrumentation and surgical techniques, with the use of more sophisticated fixation systems and the incorporation of assisted technologies, such as spinal neuronavigation and intraoperative neurophysiological monitoring [4,5]. The

pedicle screw fusion technique, based on approaches such as the Cotrel-Dubousset system, has demonstrated better correction outcomes and reduced complications, reflecting substantial progress in surgical treatment options [6,7].

This retrospective study aims to analyze the outcomes of scoliosis surgery in patients treated between 2014 and 2023 by a neurosurgical team in private hospitals in the Central-West region of Brazil. We evaluated clinical data, the efficacy of Cobb angle correction, and surgery-related complications, comparing the results with the latest trends in neurosurgical/orthopedic literature.

Objective

To analyze the population, degree of curvature correction, and complications in cases of scoliosis operated on by a private neurosurgery service between 2014 and 2023, based on the most current surgical treatment techniques.

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Methodology

This research consisted of a retrospective analysis of the medical records of patients who underwent scoliosis surgery between 2014 and 2023 at five private hospitals in the Central-West region of Brazil. The sample included 52 patients, and the analysis focused on demographic data (age, sex), type of scoliosis (idiopathic, congenital, neuromuscular), curve classification according to the Cobb method [8], Lenke classification [9] (for idiopathic scoliosis cases), postoperative evaluations, and complications.

The curvature evaluation was conducted using the Cobb angle before and after surgery. Complications were categorized as neurological, hemodynamic, or technical, considering corrective postoperative interventions.

Results

A total of 52 patients were analyzed, with a mean age of 16 years and a predominance of females (86.6%). Most patients (48) were diagnosed with Idiopathic Scoliosis (IS), while 3 had congenital scoliosis, and 1 presented with neuromuscular scoliosis. Among IS cases, 30 patients exhibited thoracic curves (Lenke 1AN, 2AN, 3BN, 4CN), and 18 had lumbar curves (Lenke 5 and 6). (Table 1) [9].

Table 1. Demographic characteristics and patient diagnosis

Characteristics	Values
Total number of patients	52
Average age of patients	16 years
Female sex	45 (86.6%)
Male sex	7 (13.4%)
Diagnosis of Idiopathic Scoliosis (IS)	48 (92.3%)
Diagnosis of Congenital Scoliosis	3 (5.8%)
Diagnosis of Neuromuscular Scoliosis	1 (1.9%)
Thoracic curves (Lenke 1AN, 2AN, 3BN, 4CN)	30 (57.7%)
Lumbar curves (Lenke 5, 6)	18 (34.6%)

The mean preoperative Cobb angle was 55°, and the mean postoperative angle was 14°, resulting in an average correction of 74% (Table 2) [8]. These results align with the latest surgical correction approaches, which report similarly significant improvements in deformities. (Figure 1)

Table 2. Preoperative and postoperative Cobb angle results

Postoperative Results	Values
Average preoperative Cobb angle	55°
Average postoperative Cobb angle	14°
Average Cobb angle correction	74%

No neurological complications were observed, reflecting the effectiveness of intraoperative monitoring techniques, such as neurophysiological monitoring, which is widely used in current clinical practice. However, three patients with more rigid deformities experienced significant bleeding, requiring intensive care and above-average transfusions. Additionally, two patients developed trunk/shoulder decompensation, necessitating revision surgery on the second postoperative day. One patient underwent reoperation four years later for extension of fixation to a lower level (Table 3).

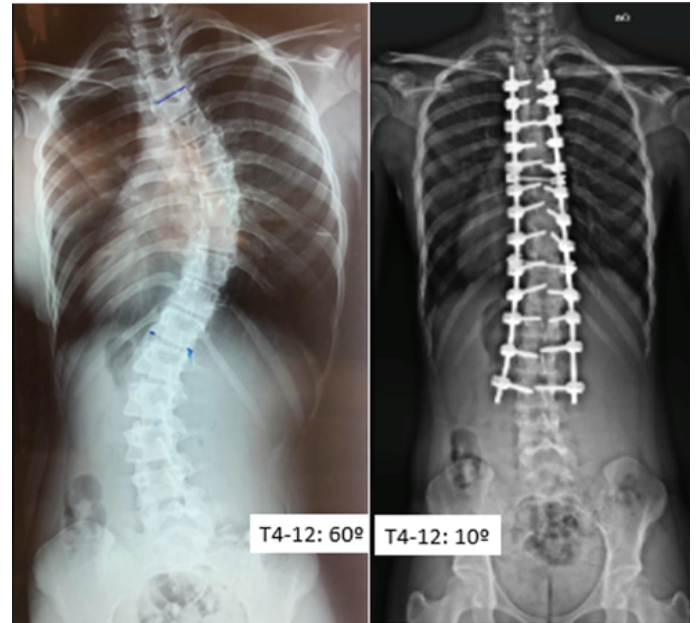


Figure 1. Preoperative full spine radiograph of a patient treated by the team, in the anteroposterior view, showing a Cobb angle of 60° (left image), and the postoperative radiograph showing a reduction in the Cobb angle to 10° (right image)

Table 3. Postoperative complications

Postoperative Complications	Values
Neurological complications	None
Significant bleeding (requiring transfusion)	3 patients (5.8%)
Trunk/shoulder decompensation (requiring revision surgery)	2 patients (3.8%)
Reoperation for fixation extension	1 patient (1.9%)

In mild scoliosis cases (curvature below 25-30°), conservative treatment is the first line. Regular monitoring is recommended for patients with minor curvatures and no immediate risk of progression. The use of braces, such as TLSO (Thoracolumbosacral Orthosis) and Milwaukee braces, is recommended for growing patients with curvatures between 25° and 45°. Early brace use has been shown in various studies to stabilize or correct curvatures significantly in up to 80% of cases [10,11].

According to the Scoliosis Research Society (SRS, 2020), conservative treatment should be adjusted based on the patient's age and deformity progression, with braces being most effective when started before skeletal maturity [12].

Surgical treatment is indicated for curvatures exceeding 45-50° or when scoliosis causes significant pain, respiratory difficulties, or rapid deformity progression. Spinal fusion with pedicle screws, rods, and hooks is the most widely used technique for correcting deformities. A recent study published in the Journal of Bone and Joint Surgery (2021) reported an average Cobb angle improvement of 70-80% postoperatively, particularly in moderate to severe thoracic and lumbar curves [3].

For severe three-dimensional deformities, combined anterior and posterior approaches may be necessary to ensure complete correction and spinal stability. The SRS suggests that in very severe cases, the Cobb angle can be reduced to values near 15-

20°, with significant functional improvement [13].

In recent years, the use of computer-assisted spinal navigation and intraoperative neurophysiological monitoring has become standard, enhancing the accuracy of pedicle screw placement and reducing neurological complication risks. Monitoring techniques, including motor-evoked potentials (MEPs) and sensory-evoked potentials (SEPs), have reduced the incidence of neurological injuries by up to 50% compared to conventional methods [4, 5].

Postoperative results in spinal fusion patients are generally satisfactory. The average Cobb angle correction is around 70-80% post-surgery, with long-term maintenance of this correction in approximately 70-85% of patients [14].

Although scoliosis surgery is effective, complications remain a significant concern. Neurological injuries are among the most severe complications, but intraoperative monitoring has significantly mitigated these risks. Studies report neurological complication rates of approximately 1-2%, with irreversible damage being very rare. Neurophysiological monitoring has been pivotal in preventing neurological injuries [15,16].

Blood loss is a common complication in scoliosis surgeries, particularly in thoracic curves or rigid deformities, with transfusions required in up to 25% of cases. Techniques like using hemostatic agents and minimally invasive approaches are recommended to minimize blood loss [17].

Postoperative infections, although rare, occur in 1-3% of cases. Prophylactic antibiotics have been effective in preventing infections, and meticulous wound care is essential to avoid secondary complications [18].

Some patients may develop postural decompensations, such as trunk deviation or shoulder misalignment, especially in complex deformities. Revision surgery may be required to address these issues in some cases [19].

Although rare, spinal compartment syndrome can occur in severe deformities, leading to chronic pain and neurological dysfunction [20].

In recent years, minimally invasive surgery (MIS) has gained popularity. Recent studies show that MIS for scoliosis, despite its learning curve, significantly reduces recovery time, blood loss, and infection risk without compromising long-term outcomes [21]. Additionally, the use of intraoperative 3D imaging and robotics has the potential to improve the precision and safety of surgical corrections [22].

Conclusion

Advances in surgical techniques and postoperative management have enabled more effective and safer corrections of scoliosis-related deformities, with a substantial reduction in neurological complications. The average 74% curvature correction observed in this study is consistent with current literature, demonstrating the effectiveness of modern surgical approaches. The demand for scoliosis treatment in Brazil's Central-West region remains high, and the results suggest that neurosurgical teams in private hospitals can successfully manage severe scoliosis cases, although challenges persist in addressing complications associated with rigid deformities.

Conflict of Interests

The authors have no conflict of interests to declare

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