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## Functional Outcome of Spinopelvic Fixation in Lumbosacral Pathologies

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### ABSTRACT

#### Background

Achieving stable lumbosacral arthrodesis remains a technical challenge owing to the high biomechanical stress. Spinopelvic fixation offers enhanced stability and good bony fusion. This study aimed to evaluate functional and radiological outcomes of patients who underwent spinopelvic fixation surgery at our institution.

#### Methods

We performed a retrospective analysis of patients who underwent spinopelvic fixation surgery between January 2017 and December 2021. Data was obtained from hospital registries in-person evaluations and telephone follow-up.

#### Results

Twenty patients (12 females, 8 males), aged 11–56 years, underwent spinopelvic fixation for various indications like scoliosis, trauma, infection and spondylolisthesis. Iliac screws were used in 15 cases and S2AI screws in five cases. Complications included hardware prominence (n=4), wound dehiscence (n=2), and implant failure (n=1). Four patients required implant removal due to various complications.

#### Conclusions

Spinopelvic fixation is an effective technique for stabilizing lumbosacral pathologies with excellent functional outcome.

**Keywords:** iliac screws; S2AI screws; scoliosis; spinopelvic fixation.

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## INTRODUCTION

Spinopelvic fixation helps to stabilize complex spinal and pelvic pathologies of the lumbosacral junction. As this anatomical region is constantly exposed to high flexion and cantilever forces, achieving solid fusion at this junction remains technically challenging. Consequently, there is an increased risk for the development of pseudarthrosis.<sup>1</sup> Spinopelvic fixation offers improved anchorage and profile, particularly in long spinal construct.<sup>2</sup> This is indicated mainly in cases of long fusions to the sacrum, neuromuscular deformities, degenerative scoliosis, lumbosacral infections, high grade spondylolisthesis, lumbar and sacral tumors and in cases of post-traumatic spinopelvic dissociation.<sup>3,4</sup> Fixation can be achieved through classical iliac screws (IS) or through newer S2-Alar-Iliac (S2AI) screws which has the added advantages of less screw prominence and avoiding the necessity of side connectors.<sup>5-7</sup> This study presents a five-year experience from our institution, examining the outcomes and complications for a range of indications. This study aimed to evaluate functional and radiological outcomes of patients who underwent spinopelvic fixation surgery at our institution.

## METHODS

This was a retrospective observational study conducted in Bharatpur Hospital, Bharatpur, Chitwan, Nepal. Patients who underwent spinopelvic fixation surgery between January 2017 and December 2021 and had a minimum 6-month follow-up period were included in this study while patients with incomplete radiographic data, those who had previous surgeries prior to spinopelvic fixation, and loss of follow-up were excluded from this study. Hospital registries were searched for demographic information, surgical and clinical data. Radiographs were reviewed to determine fusion status. Clinical outcomes were assessed via telephone and in-person evaluations. Data was extracted into a standardized excel sheet format and the collected variables were: age, sex, indication for surgery (scoliosis, trauma, infection, spondylolisthesis), fixation method (iliac or S2AI screws), intraoperative complications (sacral/sciatic

notch violation) and postoperative complications (wound dehiscence, hardware prominence), need for implant removal or revision surgery, VAS score, any change in neurology or gait and functional limitations, follow-up duration. Postoperative follow up was done through regular outpatient visits and structured telephone interviews. Clinical follow-up included assessment of pain through VAS score, neurological status for any change in ASIA grading, gait analysis and functional limitations. Radiographic follow-up included plain X-rays to assess implant status and evidence of lumbosacral fusion. Screw prominence, infection, reoperations and any other complications were noted throughout the follow-up period. Data was entered and analyzed using SPSS 16. Data was analyzed using descriptive statistical tools. Categorical variables were expressed as percentages and frequencies, and continuous variables as mean (standard deviation) or median (range).

## RESULTS

Twenty patients underwent spinopelvic fixation (12 females and 8 males). Mean±SD age was 23.4 ± 18.6 years (range: 11–56 years). The average follow-up period was 28 months (range: 6 - 58 months) (Table 1).

Table 1. Demographic characteristics of the patients. (n=20)	
Variables	Frequency (%)
<b>Age</b>	
Mean± SD of age: 23.4 ± 18.6 years, Range: 11-56 years	
<b>Sex</b>	
Males	8 (40)
Females	12(60)

Surgical and clinical information showed that, Iliac screws were used in 15 (75%) cases and S2AI screws in 5 (25%) cases. Screw placement was confirmed intraoperatively by fluoroscopy (Table 2).

No cases of intraoperative sciatic/sacral notch violations or new postoperative neurological deficits were noted. Complications were documented in seven (35 %) patients. Four patients reported hardware prominence (all associated with IS), resulting in discomfort during sitting and ambulation. Among these, three patients ultimately required implant removal to alleviate their symptoms. Two patients

**Table 2. Clinical and surgical information of the patients. (n=20)**

Indications for surgery *	Frequency (%)
Scoliosis	10(50)
Post-traumatic spinopelvic dissociation	5(25)
Infection (TB spine)	3(15)
High grade spondylolisthesis	2(10)
Types of fixations: IS	15(75)
S2AI screw	5(25)
Complications:	7(35)
Hardware prominence	4(57.14)
Wound dehiscence	2(28.57)
Implant failure	1(14.28)
Mean follow-up duration: 28 months (range 6-58 months)	

**\*Multiple response**

developed early postoperative wound dehiscence. They were managed successfully with debridement and secondary closure and had no sequelae. One patient experienced implant failure due to mechanical loosening at the screw-bone interface. He underwent revision surgery and subsequently achieved a successful spinal fusion, confirmed at 18-months follow-up. Patients with scoliosis or high-grade spondylolisthesis demonstrated significant improvements in spinal alignment and gait at their final follow-up visits. Radiographic evidence of solid lumbosacral fusion was observed in 16 patients (80%) by 12-months, with the remaining cases showing progressive trabecular bridging at subsequent follow-ups. Preoperative VAS scores were available for 18 patients and averaged  $6.8 \pm 1.4$ , indicating moderate to severe pain prior to surgery. At final follow-up (median: 28 months), the mean VAS score decreased significantly to  $2.3 \pm 1.1$ . Overall, 83.3% (15/18) of the patients experienced  $\geq 50\%$  reduction in their VAS scores, reflecting substantial pain relief in majority of patients.

**DISCUSSION**

Spinopelvic fixation is a useful technique for managing lumbosacral spinal instability, particularly in patients requiring long spinal constructs or those with complex pathologies involving the sacropelvic junction. Our five-year institutional experience supports its efficacy for various indications, including

deformity, degenerative, traumatic, infectious, and neoplastic conditions.

Our study contributes to the growing body of literature on spinopelvic fixation outcomes. There was significant decrease in VAS score following spinopelvic fixation ( $6.8 \pm 1.4$  preoperatively to  $2.3 \pm 1.1$  at final follow up in our study. This finding was supported by other studies. Sorour et al., found reduction in VAS score from  $8 \pm 1.5$  preoperatively to  $3.5 \pm 1.2$  at 6 months follow up.<sup>8</sup> Xu et al (2021) also reported significant decrease in VAS score (from  $6.8 \pm 1.1$  preoperative to  $0.8 \pm 0.7$  at final follow up) and ODI scores (from  $44.3 \pm 6.7$  to  $9.3 \pm 1.9$ ) and bone fusion following spinopelvic fixation of lumbosacral junction tuberculosis in adults.<sup>9</sup> Similarly, Uvaraj et al., noticed that spinopelvic fixation resulted in marked improvement in Oswestry Disability Index (ODI) and Scoliosis Research Society (SRS) scores at 5 years follow up.<sup>10</sup> This suggests that spinopelvic fixation provides robust and stable fixation of the spinopelvic junction, resulting in decreased pain and better patient experience. We had complications in about 35% of the patients among which hardware prominence and wound dehiscence were the most common. All of these complications were found in patients with iliac screws and there were no complications in patients with S2AI screws. This finding was similar to studies by Akesen et al., who reported no complications in neuromuscular scoliosis patients who underwent spinopelvic fixation<sup>11</sup> and Ravindra et al., who found in a systematic review that spinopelvic fixation in pediatric neuromuscular scoliosis resulted in wound complications in 12.2% cases, instrumentation complications in 13% cases and reoperation in 1.1% of the cases.<sup>12</sup> This suggests that spinopelvic fixation is a safe technique with very few complications. Complication rates also varied between spinopelvic fixation cases managed with S2AI screws and iliac screws in literature. Shin et al., found that while implant failure rates were similar between the groups (21.9% for IS vs. 18.9% for S2AI;  $p = 0.59$ ), S2AI screws were significantly superior in reducing the rates of revision surgery (8.5% vs. 21.0%;  $p = 0.02$ ), screw prominence (0.0% vs. 9.6%;

$p < 0.01$ ), and wound complications (3.9% vs. 31.7%;  $p < 0.01$ ).<sup>13</sup> These trends align with our experience, in which hardware prominence, wound complications and revision surgery were observed only in patients with iliac screw placement. Hasan et al., reported that S2AI screws significantly reduced screw prominence (odds ratio = 5.99;  $p < 0.001$ ) and were associated with lower overall complication rates compared to iliac screws.<sup>14</sup> This is similar to our study where screw prominence was noted only in cases with iliac screws. Nazemi et al., noted no hardware prominence in S2AI patients, which is consistent with our findings.<sup>15</sup> Our data from a resource-limited setting confirm that spinopelvic fixation is a safe and effective technique

with excellent functional outcomes.

## Limitations

The limitations of this study include the retrospective design, small sample size, and reliance on telephone follow-up for clinical outcomes in some cases.

## CONCLUSIONS

Spinopelvic fixation has excellent functional outcomes with fewer complications. Future prospective studies with larger cohorts are warranted to validate these findings and to explore long-term outcomes.

**Conflict of interest:** None

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