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## Research Article

## Long-Term Systematic Outcome Assessment of Patients Following Spine Surgery in Rwanda: The Use of Patient Reported Outcome Tools

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## ABSTRACT

**Background:** We conducted a systematic evaluation of neurological, functional, quality of life and pain outcomes of patients who underwent spine surgery in our neurosurgery unit using patient reported outcome (PRO) assessment tools.

**Methods:** The study was performed by assessing outcome of all the patients who underwent spine surgery at our department in a cross-sectional fashion using a 5-year operative database. This was an all-inclusive spine outcome study with 2 main groups; a trauma group composed of spinal cord injured patients and a non-trauma group composed of patients with spinal degenerative diseases, spinal tumors, deformity, infection, and vascular malformations.

**Results:** Our analysis included 197 patients who met inclusion criteria for the study. The overall study population was mainly dominated by spinal cord injured patients and spinal degenerative disease patients; 34 % and 60.9 % respectively. The average age was 42 years (range: 15-78 years) with patients in the trauma group being substantially younger than the rest of the cohort. Eighty five percent of trauma patients presented with spinal cord injury causing neurological deficit, of which 58% had no preservation of motor function below the level of injury; ASIA IS A and B (35.8% and 22% respectively). Additionally, 68% of patients in the non-trauma group underwent surgery with severe disability. Overall, 60% of all trauma patients showed improvement of their neurological status as per ASIA IS. Of note, 40% of patients with preoperative ASIA IS B and 8% of patients with preoperative ASIA IS A gained full neurological recovery postoperatively (ASIA IS E). Using the Core outcome measurement Index (COMI) from patient's perspective, 78.6% of patients reported to have no pain significant enough to make them stop their normal daily activities. Rate of overall return to work (RTW) in the non-trauma group was 77% with 52% of patients being fully functional without condition-related work interruptions.

**Conclusion:** Careful selection of patients for surgery is key for good outcome of patients undergoing spine surgery. In contradiction to most other patients' groups, patients with severe disability with spinal degenerative conditions might benefit most from surgery. Postoperative outcome of spinal cord injured patients with severe neurological deficits might be better than commonly believed. Controlled prospective data is likely to draw stronger conclusions.

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## Background and Study Objectives

Spine pathology represents a significant health burden worldwide [1]. Pain is a universal presenting complaint for most spine pathologies being traumatic or non-traumatic; lower back pain (LBP) is well documented as an extremely common health problem. It is the leading cause of activity limitation and work absence throughout much of the world, and it causes an enormous economic burden on individuals, families, communities, industry, and governments [1-3].

The 21st century has been particularly fruitful for spine surgery; there is little resemblance of spine surgery today compared to that practiced in the past; recent advances are especially pronounced for both open and minimally invasive spine procedures and like in many areas of medicine, progress is on an accelerated pace [4, 5]. The single most important pillar for the advanced state-of-the-art treatment of spine-related problems is the better understanding of spine biomechanics [6]. It is now standard practice that evaluation of treatment outcomes be patient centered; where outcomes of interest reflect factors important to the patient such as, adequate pain control, quality of life and functionality [7]. For spine outcome assessment, quality of life tools and patient perspective instruments are being increasingly developed and used [8].

Although spine surgery in Rwanda is in its early years, a wide range of spinal pathologies are currently being treated. The true value of our spinal interventions can be determined only by a systematic examination of patient outcomes. In the current study, we evaluated outcome of patients who underwent spine surgery for different spine pathologies, namely spinal degenerative diseases and deformity, traumatic spinal cord injury, spinal tumors and spinal vascular malformations, focusing mainly on neurological spinal cord injury recovery and ‘patient’s perspective’ outcome assessment. Our main objective was to evaluate postoperative outcome of patients following spine surgery. The following were our specific study end-points:

- i. To determine postoperative Neurological and functional improvement of all traumatic spinal cord injured patients and spine degenerative disease patients, respectively.
- ii. To determine postoperative status of all patients with spine-related pathologies using patient reported outcome (PRO) scales.

## Patients and Methods

### I Study Design

This study was a 2 phased project; the first phase was a retrospective chart review of all patients operated for spine-related pathologies by the senior author (A.E.N) over a period of 5 years; from October 2011 to December 2016. The study site was King Faisal Hospital, Kigali. At the time of the current study, this was the only tertiary referral center for spine surgery in Rwanda.

Patient’s demographics, preoperative clinical status and operative details were all recorded. The study population was made by 2 main groups; a group of patients with traumatic spinal cord injury referred to as the ‘trauma group’, and a group of patients with degenerative spine diseases, spinal tumors, and others (vascular malformations, infections and deformity) referred to as the ‘non-trauma group’. The major study

groups: trauma and non-trauma have been further subdivided into cervical, thoracic, and lumbosacral subgroups in order to assess more homogenous groups of patients.

Information regarding preoperative pain status in terms of neck pain, back pain and radicular pain has been obtained for all patients (trauma and non-trauma groups) using numerical rating pain scale (see supplementary Table 1). A score of 0 is equivalent to “no pain”, Scores of 1 to 3 have been graded as “mild pain”, scores of 4 to 6 “moderate pain” and 7 to 10 as “severe pain”.

The second phase was a cross sectional outcome assessment. In order to have long-term outcome data for most patients with the shortest follow-up period being 12 months, this phase was done in December 2017 over a period of one month. Outcome assessment was done by an independent team of medical professionals who have not been involved in the management of the patients at any point.

For the first primary end-point of the study, pre and postoperative neurological status were determined using the American Spinal Injury Association Impairment Scale (ASIA IS - see supplementary Table 3) and Nurick grading scale tool (see supplementary Table 2) applicable for spinal cord injured patients and spine degenerative disease patients respectively. Disability for cervical degenerative patients was categorized as follows; Nurick 0 and 1 = no disability, Nurick 2 = mild disability, Nurick 3 = moderate disability, Nurick 4 and 5 = severe disability.

For the other groups of patients (patients with lumbosacral spinal degenerative diseases, spinal deformity, infection, and tumors), severity was graded according to presence and severity of neurological status hampering employment (severe radiculopathy, neurogenic claudication, and cauda equina syndrome were graded as severely disabling symptoms).

All patients were assessed from their own perspective. Patient reported outcome measures were used to determine their pain status, functional status, and their quality of life, using the core outcome measurement index (COMI), a validated post-treatment outcome tool for spine patients from patient’s perspective (see supplementary Table 4). Of note, patients were asked to respond to the COMI questions in their utmost freedom. For pain related questions, patients were asked to report about their current pain status when off any form of analgesics (opioids and non-opioids medications).

### II Selection Criteria

All the patients aged 15 years and above operated for spine related pathologies including trauma, degenerative diseases, tumors, infection, and deformities were included in the study. We excluded all the patients on whom pre and postoperative information could not be found especially due to missing contact information.

### III Data Analysis Methods

The baseline preoperative data were collected using Excel then imported to STATA software 12.0. With this database, descriptive statistical analysis was performed. Using neurological, functional, and quality of

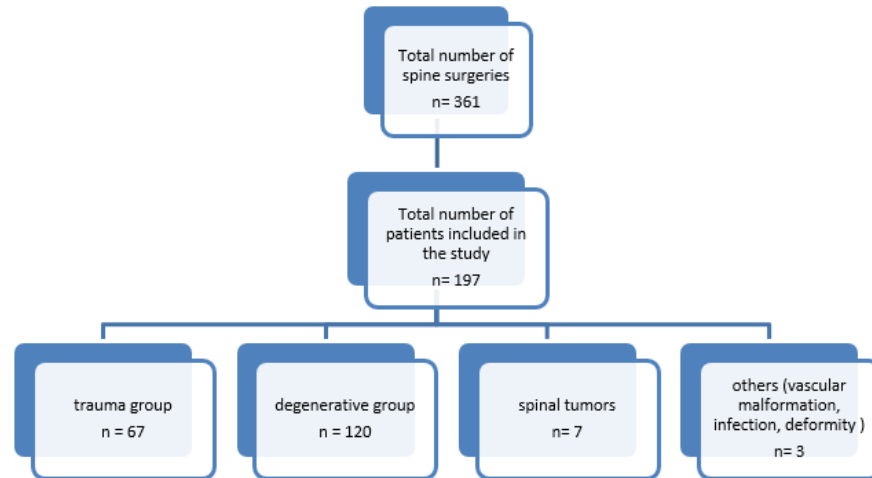
life outcome tools (COMI, ASIA IS), we run comparative pre and postoperative analysis for determination of our study end points using Fisher exact test.

**Results**

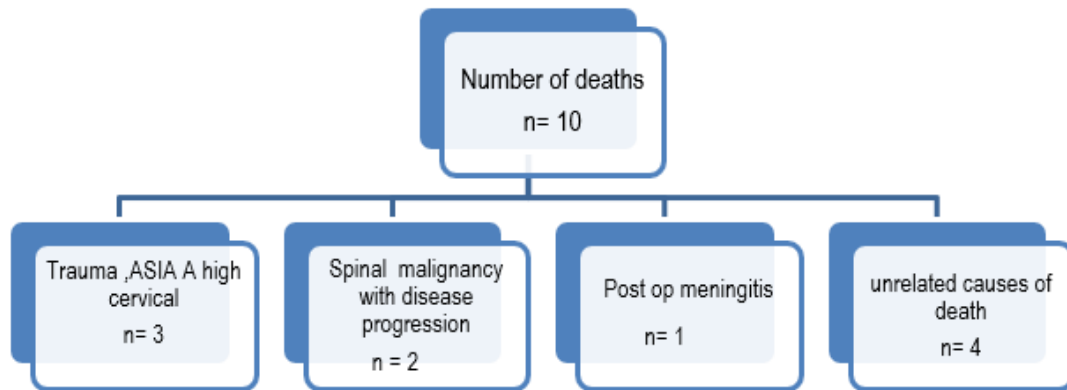
**I Study Population**

Our retrospective chart review identified a total of 361 patients operated for spine-related pathologies by the senior author A.E.N. Figure 1

provides an overview of the study population. The cross-sectional outcome assessment study for primary end point determination was done on a total of 197 patients on whom complete pre and postoperative information could be obtained. Furthermore, at the time of outcome assessment, 10 patients had died for various causes. Patient reported outcome (PRO) using Core Outcome Measurement Index was hence obtained from 187 patients. Please see (Figure 2) for details of causes of death.



**Figure 1:** Flowchart of study population.



**Figure 2:** Mortality and causes of mortality.

**II Demographics**

The overall study population was mainly dominated by patients with spinal cord injuries and spinal degenerative diseases; 34 % and 60.9 % respectively. See (Table 1) for general characteristic of the study population. The overall average age was 42 years (15-78 years) with

patients in the trauma group being substantially younger than the rest of the cohort. The overall male-female ratio was 1.6/1 and this difference was more pronounced for trauma patients (male-female ratio for trauma; 2.7/1). See (Table 2) summary of demographic data per spine pathology group.

**Table 1:** General characteristic of the study population, n=197.

Variable		Freq.	%
Gender	male	123	62.4
	female	74	37.5
Age category	15 – 45	114	57.8
	46 - 60	58	29.4

	61 -75	22	11.2
	Above 75	3	1.5
Income level (pre -op) With correction in the national Ubudehe social economic grade	Low income (grade 1& 2)	86	43.6
	Middle (grade 3)	39	19.8
	High income (Grade 4)	25	12.6
	Don't know	47	23.8
Spine pathology groups	Trauma	67	34
	Degenerative	120	60.9
	Tumors	7	3.5
	Others;Spinal AVF, spinal Infection and deformity	3	1.5

**Table 2:** Summary of Demographic and Baseline Characteristics n (197), according to spine pathology.

Variable		Trauma Freq. (%)	Degenerative Freq. (%)	Tumor Freq. (%)	Other Freq. (%)	P values
Gender	Male	49(24.8)	69(35)	3(1.5)	2(1)	
	Female	18(9)	51(25.8)	4(2)	1(0.5)	
Age	[15-30]	23(11.6)	11(5.5)	4(2)	2(1)	P<0.0001
	[31-45]	30(15.2)	42(21)	1(0.5)	1(0.5)	
	[46-60]	13(6.5)	44(22.3)	1(0.5)	0(0)	
	[61-75]	1(0.5)	20(10)	1(0.5)	0(0)	
Social economic status	High income	8(4)	17(8.6)	0(0)	0(0)	P=0.8596
	Medium income	15(7.6)	24(12.1)	0(0)	0(0)	
	Low income	19(9.6)	37(18.7)	1(0.5)	0(0)	
	No Job	8(4)	20(10)	1(0.5)	0(0)	

**III Preoperative Clinical Data**

Pain was a universal complaint for all the patients preoperatively. The majority of patients had symptoms associated with root involvement; severe radicular pain was present in 55% of patients preoperatively and

22% of these had features of cauda equina syndrome. Lower back pain was more prevalent than neck pain; 35.5% vs. 17.7% respectively (see Table 3).

**Table 3:** Preoperative symptoms and severity for all the patients, n =197.

Variable		Freq.	%
Neck pain	Severe	35	17.7
	Moderate	14	7.1
	Mild	1	0.
Back pain	Severe	70	35.5
	Moderate	22	11.17
	Mild	2	1
Radicular pain (any)	Severe	110	55.8
	Moderate	72	36.5
	Mild	10	5
Cauda Equina syndrome	Present	45	22.8
	Absent	133	67.5
	no response	19	9.6

**Table 4:** Summary of preoperative neurological status for trauma patients.

ASIA impairment scale (ASIA IS)	Cervical patients Freq. (%)	Thoracic, lumbar and thoracolumbar Patients Freq. (%)	Total (%)	Cum.
<b>A</b>	11(16.4)	13(19.4)	24(35.8)	35.82

<b>B</b>	12(17.9)	3(4)	15(22.4)	58.21
<b>C</b>	2(3)	4(6)	6(8.9)	67.16
<b>D</b>	5(7.4)	5(7.4)	10(14.9)	82.09
<b>E</b>	8(12)	4(6)	12(17.9)	100
Total	38(56)	29(43)	67(100)	

**Table 5:** Preoperative disability grading for the non-trauma patients (spine degenerative patients and others).

Disability	Cervical subgroup Freq (%)	Lumbosacral subgroup Freq (%)	Overall -non trauma group Freq (%)
<b>Mild</b>	8 (6.1)	16 (12.3)	24 (18.4)
<b>Moderate</b>	11 (8.4)	6 (4.6)	17 (13)
<b>Severe</b>	35 (27%)	52 (40%)	89 (68.4)
<b>Total</b>	54 (41.5)	74 (57)	130 (100)

**i Preoperative Clinical Status – Trauma Group**

The trauma group comprised 34% of our general population. All trauma patients have been preoperatively graded using ASIA IS (see Table 4). Eighty five percent of trauma patients presented with spinal cord injury causing neurological deficit, of which 58% had no preservation of motor function below the level of injury; ASIA IS A and B (35.8% and 22% respectively). The cervical trauma subgroup made up the majority of the trauma group (56%), and there was no substantial difference in neurological status at presentation in both cervical and thoracolumbar subgroups.

**ii Preoperative Clinical Status – Non-Trauma Group**

Overall, most (68.4%) patients in this group were operated with severe disability. Patients in the lumbosacral subgroup tended to present with more disability impairing substantially their functional status than patients in the cervical subgroup (40% vs. 27%), P < 0.001 (see Tables 3 & 5).

**Table 6:** Types of spine surgeries performed.

		Freq.	Percent	Cum.
<b>Cervical</b>	ACCF	33	16.8	16.8
	ACDF	40	20.3	37.1
	Posterior cervical laminectomy + fusion	14	7.1	44.2
	Laminectomy+tumor removal	1	0.5	44.7
	Posterior cervical laminoplasty	4	2.0	46.7
<b>CCJ</b>	C1-C2fusion	2	1.0	47.7
	O-C-Fusion	1	0.5	48.2
<b>Thoracic</b>	Posterior decompression + T-L fusion	15	7.6	55.8
	Posterior thoracic decompression +fusion	9	4.6	60.4
	T spine tumor resection	7	3.6	64.0
<b>Lumbar</b>	Lumbar decompression only	27	13.7	77.7
	Lumbar decompression + fusion	44	22.3	100
	Total	197	100.0	

**IV Operative Data: Types of Surgery Done**

The most commonly done surgery was anterior cervical decompression and fusion (ACDF or ACCF). It comprised 37% of all the spine surgeries done during the study period. Posterior lumbar decompression surgeries were the second most commonly performed; 36%. This was done with and without additional fixation procedure in 22.3% and 13.7% of cases, respectively (see Table 6).

**V Outcome Assessment Data (Postoperative Results)**

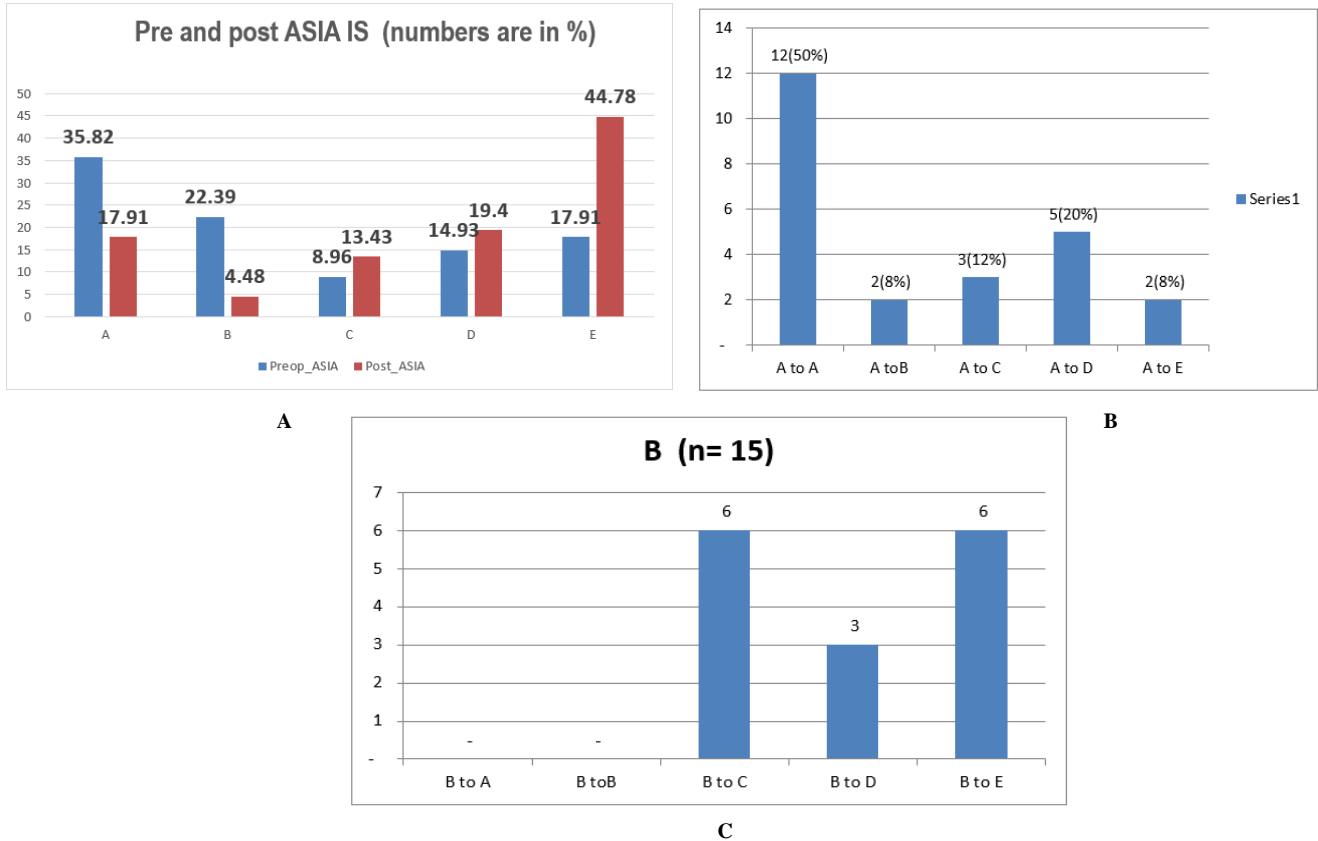
The overall average time of follow up was 31 months, ranging from 10 to 72 months.

**i Trauma Group**

Overall, 60% of all trauma patients showed improvement of their neurological status as per ASIA IS. Of note 50% of patients with ASIA

IS A showed some degree of improvement; 2 patients (8 %) to ASIA B, 3 patients (12%) to ASIA C, 5 patients (20.8% ) to ASIA D and 2 patients (8 %) to ASIA E.

All the 15 patients with preoperative ASIA IS B improved after surgery; 40% of them regained full neurological recovery (ASIA IS E). The rest improved to ASIA C and D (40% and 20% respectively); please (see Table 7) and (Figures 3A, 3B & 3C) for the details.



**Figure 3:** A) Patient’s neurological status pre and postoperatively. B) Postoperative neurological progression of ASIA A patients, n= 24. C) Postoperative neurological progression of ASIA B patients, n = 15.

**Table 7:** Postoperative neurological outcome for all trauma patients.

Preoperative ASIA IS, and corresponding number of patients	Grades	Postoperative ASIA IS				
		A	B	C	D	E
A (n=24)		12	2	3	5	2
B (n=15)		-	-	6	3	6
C (n = 6)		-	-	-	-	6
D (n=10)		-	-	-	3	7
E (n =12)		-	1	-	2	9

**Table 8:** Patient’s normal activity impairment by pain.

Activity impairment by pain	Freq.	Percent	Cum.
Not at all	108	57.75	57.75
A little	39	20.86	78.61
Moderately	26	13.9	92.51
Quite a bit	14	7.49	100
Total	187	100	

**ii Outcome Assessment of all the Patients using Patient Reported Outcome (PRO) Measurements**

**a Pain Status Assessment**

We have assessed current pain status (i.e. pain at the time of outcome assessment) as per COMI (see Table supplementary); Overall, 122 (65.2%) patients reported to have no pain at the time of outcome assessment. Seven-teen percent reported mild pain, 15% reported moderate pain and 1.6% reported severe pain (see Figure 4 for details) We also assessed the degree to which patient’s normal activities are affected by pain status. The majority of patients; 78.6% reported to have no pain significant enough to make them stop their normal activity. The rest of patients reported being moderately or quite significantly disturbed

by their pain during their normal activities (13.9% and 7.4% respectively), (see Table 8) for details.

**b Patient Reported Quality of Life**

Patients were asked to grade their own perception of overall health status. This information was obtained on 187 patients (not including the patients who had died by the time of outcome assessment). Cumulatively 65.7% of patients reported to have good and acceptable quality of life and 34.2 % reported to have a bad quality of life. The most common reasons for bad quality of life were poor urinary control, poor sexual life, neurological deficit, pain, or a combination of the above (see Table 9).

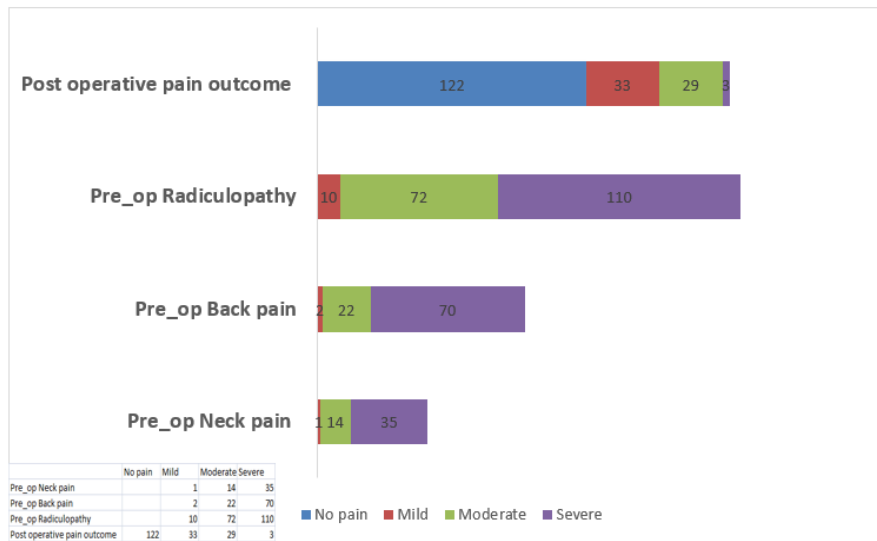


Figure 4: Postoperative pain outcome summary.

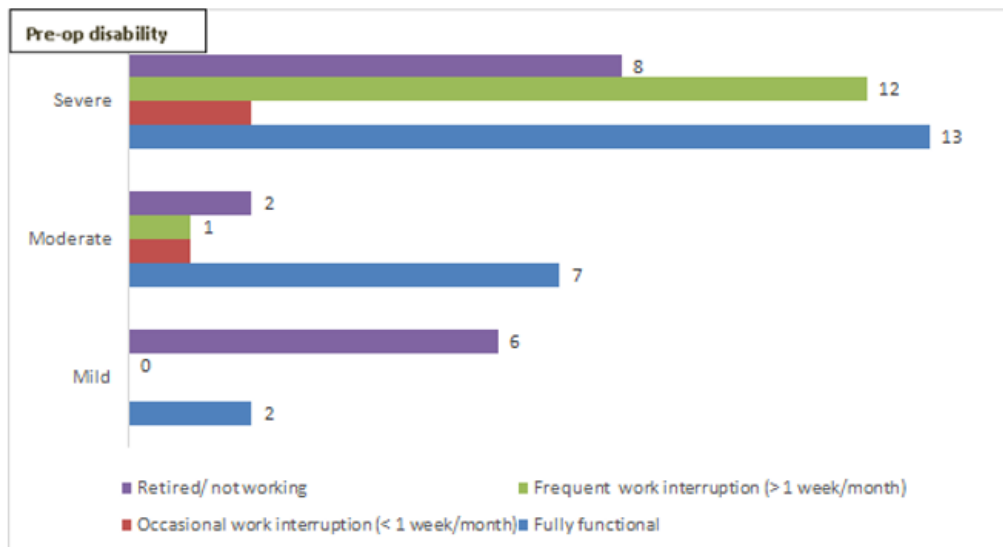


Figure 5: Postoperative functional status as per preoperative disability – cervical subgroup.

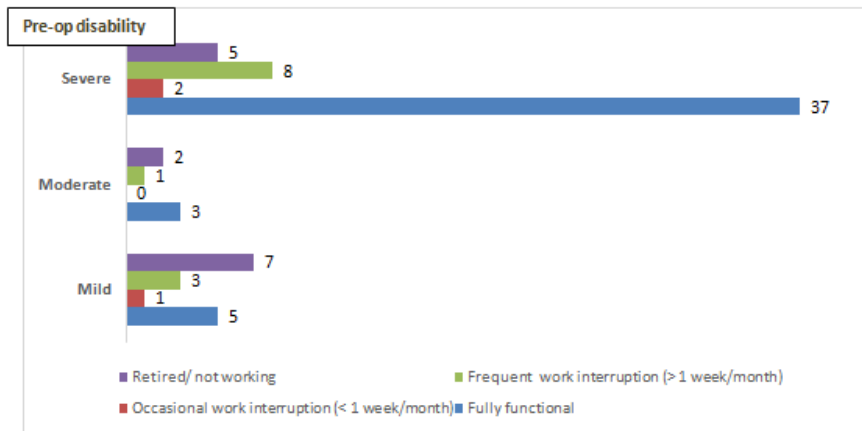


Figure 6: Postoperative functional status as per preoperative disability – lumbar subgroup.

Table 9: Postoperative patient reported overall quality of life.

Quality of life		Freq	Percent	Cum
Patient’s rating of overall quality of life	Good	70	37.43	37.43
	Acceptable	53	28.34	65.78
	Bad	64	34.22	100

Table 10: Postoperative Functional status of patients employed at the time of outcome assessment, all patients inclusive n=154.

Variables		Preoperative disability			
		Overall Freq (%)	Mild N= 65	Moderate N= 13	Severe N= 76
Postoperative functional status	Fully functional	98(63%)	37(56%)	10(76%)	51(67%)
	Occasional interruption (< 1 week/ month)	8(5.2%)	3(4.6%)	1(7.6%)	4(5%)
	Frequent interruption (> 1 week/month)	48(31%)	25(38.4%)	2(15%)	21(27%)

Table 11: Overall functional outcomes of patients in the “non trauma” group.

Valuables		Degenerative and other non-trauma subgroups		
		Overall n=130	Cervical N= 54	Thoracic and lumbar N=74
Postoperative functional status	Fully functional	68 (52%)	22(40%)	45(72%)
	Occasional interruption (< 1 week/ month)	6(4.6%)	3(5%)	3(4%)
	Frequent interruption (> 1 week/month)	26(20%)	13(24%)	12(16.2%)
Not working/retired		30 (23%)	16(29%)	14(19%)
Total		130 (100%)	54(100%)	74(100%)

Table 12: Pre and postoperative Functional status for patients with spinal non trauma cervical vs. thoracic and lumbar pathology.

Valuables		Preoperative disability cervical subgroup			Preoperative disability Thoracic and lumbar subgroup		
		Mild (n=8)	Moderate (n=11)	Severe (n= 35)	Mild (n=16)	Moderate (n=6)	Severe (n=52)
Postoperative functional status	Fully functional	2	7	13	5	3	37
	Occasional interruption (< 1 week/ month)	0	1	2	1	0	2
	Frequent interruption (> 1 week/month)	0	1	12	3	1	8
	Retired/not working	6	2	8	7	2	5



**iii Overall Postoperative Functional Status**

At the time of outcome assessment, 83.6% (154 out of 187) of all the patients were working and 17.6% (33 out of 187) were not (either retired or not able to work). Of the 154 patients who were working, 98 patients (63.6%) were fully working without interruption related to their condition; “fully functional”. The remaining 37% had occasional or frequent work interruptions. Of the 76 patients who were severely disabled preoperatively, 51 (67%) reported to be fully functional at the time of assessment (see Tables 10 & 11 for details).

**Discussion**

This study is unique in its all-inclusive nature; including all patients who had surgery for different spine pathologies

- i. **Demographics:** The distribution of age and sex showed a substantially young population and male predominance in the trauma group; similar to what is found in other African spinal cord injury studies [9, 10].
- ii. **Clinical Presentation and Outcome:** Pain was a universal complaint for all the patients preoperatively, and for most patients it was graded as severe. Postoperative response in pain reduction was remarkable; only 3 patients out of 187 still had severe pain at time of outcome assessment, and as many as 122 (65.2%) patients reported to have no pain. Functional disability recovery was also related to preoperative status; for patients in the non-trauma group, the ones with more severe preoperative disability were more likely to be fully functional and had less health related work interruptions than the ones with mild preoperative disability; 67% vs. 56% and 27% vs. 38.4% respectively. Upon subgroup analysis of functional disability for cervical and lumbar degenerative subgroups, patients in the latter subgroup were more likely to be fully functional (72% vs. 40%). The rate of unemployed patients was also less in the lumbar subgroup (19% vs. 29%). This might be a reflection of disabling nature of cervical myelopathy severely hampering functionality and employment. As opposed to many countries in the developed world, there is no financial compensation for failure to return to work (RTW) after spine surgery in Rwanda; thus, our findings have little if any financial bias [11].
- iii. **Neurological Outcomes for Trauma:** Another primary end point of this study was evaluation of postoperative neurological status of patients operated for traumatic spinal cord injury.

Postoperatively, patients with intact neurological function (ASIA E) increased from 17.9% to 44%. There was a corresponding decrease,

postoperatively, in the number of patients with ASIA A and B impairment scales of 38% to 17.9% and 22.3% to 4.8% respectively. Fifty percent of ASIA A patients improved neurologically. The most striking improvement was noted for ASIA B patients; all of them improved to at-least one grade after surgery and 40% of them were neurologically intact (ASIA E) at time of cross-sectional outcome assessment. We found only one study with long term postoperative follow up of Traumatic spinal cord injury in the region; in that study, of the 49 patients present for follow up, 42% of patients with incomplete injury and 17% of complete injury improved [5].

There was a striking difference in neurological improvement of patients with complete injury (ASIA A) and those with complete motor with sensory preservation (ASIA B) in our study. Spinal cord injury severity is known to be a primary and robust predictor of functional recovery [12]. Sensory preservation to pin prick in at least the sacral segments predicts motor recovery [13]. Preservation of spino-thalamic tract may be a sign of reversibility of injury in the lateral corticospinal tract due to their proximity in the spinal cord [14].

Furthermore, some of these traumatic spinal cord injuries are associated with high rate of mortality when treated non-operatively [9, 10, 15].

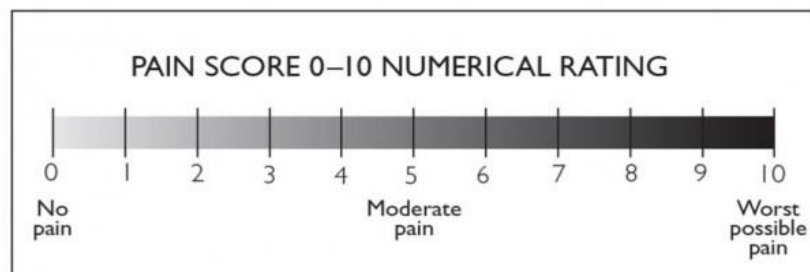
**Conclusion**

Careful selection of patients for surgery is a key for good outcome of patients undergoing spine surgery. In contradiction with most other patients’ groups, patients with severe disability with spinal degenerative conditions might benefit most from surgery. Postoperative outcome of spinal cord injured patients with severe neurological deficits might be better than commonly believed. Controlled prospective data is likely to draw stronger conclusions.

**Abbreviations**

- ACCF:** Anterior Cervical Corpectomy and Fusion
- ACDF:** Anterior Cervical Discectomy and Fusion
- ASIA IS:** American Spinal Injury Association Impairment Scale
- CCJ:** Cranial Cervical Junction
- COMI:** Core Outcome Measurement Index
- LPB:** Lower Back Pain
- O-C Fusion:** Occipito-Cervical Fusion
- PRO:** Patient Reported Outcome
- RTW:** Return to Work
- T-L Fusion:** Thoracolumbar Fusion

**Supplementary Table 1:** Numeric rating pain scale.



Supplementary Table 2: The NURICK scale.

Chart 2. NURICK scale.	
Grading	NURICK clinical scale
Grade 0	Signs and symptoms of root involvement but without evidence of spinal cord disease.
Grade 1	Signs of spinal cord diseases but no difficulty walking.
Grade 2	Slight difficulty in walking which does not prevent full-time employment.
Grade 3	Extreme difficulty in walking that requires assistance and prevents full-time employment and occupation.
Grade 4	Able to walk only with someone else's help or with the aid of a walker.
Grade 5	Chairbound or bedridden.

Supplementary Table 3: ASIA Impairment Scale.

<b>A=Complete</b>	No motor or sensory function is preserved in the sacral segments S4–S5
<b>B=Incomplete</b>	Sensory but no motor function is preserved below the neurological level and includes the sacral segments S4–S5
<b>C=Incomplete</b>	Motor function is preserved below the neurological level, and more than half of key muscles below the neurological level have a muscle grade less than 3
<b>D=Incomplete</b>	Motor function is preserved below the neurological level, and at least half of key muscles below the neurological level have a muscle grade of 3 or more
<b>E=Normal</b>	Motor and sensory function are normal

Supplementary Table 4: Core outcome measurement index

Spine Outcome Study outcome tool: the Core Outcome Measure Index (COMI)

Back problems can lead to back pain and/or pain in the legs and/or buttocks, as well as sensory disturbances such as tingling, "pins and needles", or numbness in any of these regions.

For the following 2 questions (1a and 1b), we would like you to describe how severe is your pain, if any, by making a cross on the line from 0 (no pain), to 10 (worst pain).

1. a. How was your back pain in the last week?

NO PAIN  0  1  2  3  4  5  6  7  8  9  10  WORST PAIN

1. b. how severe was your leg pain (and/or buttock pain) for the last week?

NO PAIN  0  1  2  3  4  5  6  7  8  9  10  WORST PAIN

2. during the last week, how much did you have your back pain interfere with your work?

- 1. Not at all
- 2. A little
- 3. Moderately
- 4. Quite a bit
- 5. Extremely

3. If you had to spend the rest of your life with the symptoms you have now, how would you feel?

- 1. Very satisfied
- 2. Somewhat satisfied
- 3. Neither satisfied nor dissatisfied
- 4. Somewhat dissatisfied
- 5. Very dissatisfied.

Source, Spine 2015- Lippincott Williams and Wilkins

4. Please reflect on the last week; how you would reflect on your quality of life

- 1. Very good
- 2. Good
- 3. moderate
- 4. Bad
- 5. Very bad

5. During the last 4 weeks, how many days did you have to cut down on the things you usually do (housework, recreational activities.)

- 1. None
- 2. Between 1 and 7 days
- 3. Between 8 and 14 days
- 4. Between 15 and 21 days
- 5. Above 21 days.

6. During the last 4 weeks, how many days did your symptoms keep you from going to work?

- 1. None
- 2. Between 1 and 7 days
- 3. Between 8 and 14 days
- 4. Between 15 and 21 days
- 5. above 21 days.

Directives for scoring:

- ♦ The 'pain score' is the higher of the 2 first scores (1a and 1b)
- ♦ The 'disability score' is the average of the 2 last questions (5 and 6)
- ♦ The five domain scores for: pain (higher of 1a and 1b), back related function (item 2), symptom specific well-being (item 3), general quality of life (item 4) and disability (average of scores 5 and 6), are then averaged to give a COMI score from 0 to 10.

Source, Spine 2015- Lippincott Williams and Wilkins

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