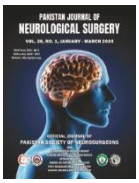

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Original Research

Complications of Post-Traumatic Spinal Surgery

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ABSTRACT

Objective: The study aimed to evaluate the frequency and complications of post-traumatic spinal surgeries.

Materials and Methods: A prospective observational study was conducted at JPMC for six months and included 55 patients presenting with post-traumatic spinal injuries who were operated on. Information on the patient's demographics, clinical findings, radiological findings, type of surgical procedure, and postoperative complications were recorded. A chi-square test was employed to compare difficulties with demographic characteristics.

Results: Our study comprised of patients with an age of 39.55+/-6.19 years; of them, 72.7 percent were males, and overall complications occurred in 30.9 percent of patients, which included wound infection (10.9%), CSF fistula (3.6%), wound dehiscence (1.8%), pneumonia (3.6%), heart arrhythmia (1.8%), lung congestion (1.8%), instrumental loosening (1.8%), postoperative visual loss (1.8%), and diathermy burns (3.6%).

Conclusion: 30.9 percent of patients operated for spinal traumatic injuries developed complications. A few of these complications are dreaded and need to be communicated to patients/attendants and necessary steps should be taken to prevent them.

Keywords: Complications, Spinal Surgery, Traumatic, Tertiary Care Hospital, Postoperative.

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INTRODUCTION

The main concern for both doctors and patients is complications following post-traumatic spinal surgeries.[1] If they arise, they may have negative personal, psychosocial, and financial effects that impair a patient's quality of life and level of future independence.[2] Emotional stress can be the reason why surgeons and gynecologists live shorter lives than other doctors, according to various studies. A significant source of stress for surgeons is postoperative complications.[3] Intraoperatively, immediately after surgery, or

later on, there can be complications. If these problems are not identified and addressed, they could result in severe or even permanent morbidity.[21] More efforts are being made to improve the quality of healthcare received during surgery, with a focus on patient satisfaction, radiological results, and clinical outcomes recorded through patient-reported outcome measures.[4] Hence, it is very important to delineate these complications, knowing this would be the first step in being more prepared to cope with them. Physicians and health administrators are constantly focused on lowering the frequency of these problems.[5] Pay-for-performance reimbursement strategies aim to connect practitioner compensation with patient outcomes.[6] Such financial benefits are a component of a strategy to lower hospital-acquired illnesses and hospitalization costs.[7]

Due to differences in technique and sample size between studies, the frequency and prevalence of complications in spinal surgery have been reported in the literature in a wide range of ways.[8] Complications haven't been evaluated in many prospective trials.[9] In addition, opinions differ on what can be a risk factor for problems after spine surgery.[10] Yousefifard et al. showed that early spinal surgery may improve neurologic recovery and is also linked with lower post-traumatic surgical complications.[11] For proper therapeutic decision-making, it is necessary to define the complications and risks of spinal procedures in the context of various demographics and comorbidities. Once this is done, patients may use the presented data to determine whether or not to undergo invasive surgery. Therefore, the current study aimed to evaluate the frequency of complications following post-traumatic spinal surgery and also to pinpoint patient-related risk factors.

MATERIALS AND METHODS

Study Design & Setting

This prospective observational study was conducted after hospital ethical committee approval on 55 patients with post-traumatic spinal surgery at Jinnah Postgraduate Medical Centre (JPMC), Karachi for 6 months.

Inclusion Criteria

Patients were sampled using non-probability consecutive sampling. Informed consent was obtained from patients and attendants. Patients aged >18 years, both genders, and presenting with a traumatic spinal fracture were included in the study.

Exclusion Criteria

Exclusion criteria included non-traumatic fractures, age<18 years, and preexisting infections (e.g., wound infection, bedsores, etc.). For purposes of the current study, complications in post-traumatic spinal surgery were defined as "any untoward event occurring to a patient while in the neurosurgical service". In the current study, the complications were classified as technical, specific, and general (Table 1).[12]

Table 1: Classification of the complications in post-traumatic spinal surgery.

General	Specific	Technical
Death	Blood collection/Clot	Improper screw fixation
Thrombus formation	Superficial infection	Instrumental loosening
Blood transmitted infections	Deep Tissue infection	Displaced transplant
Gastric problems	Injury of nerve root	
Issues related to urinary tract	Iatrogenic Tear of Dura/ CSF fistula	
Lung complications	Cauda Equina	
Skin related issues	Pain at the site of the implant	

Mental health issues	Others
Postoperative visual loss	

Data Collection

The study variables were gender, age, BMI ("body mass index"), comorbidity (hypertension, diabetes mellitus, depression, osteoporosis, smoking, and others), and complications given in Table 1. The data was collected by the researcher from the patients through a questionnaire.

Data Analysis

Quantitative variables were presented as mean with standard deviation, and qualitative variables were presented as frequency with percentages. A chi-square test was also used for the comparison of complications with demographic variables. SPSS 23 was used for the analysis of the data, and a p-value less than 0.05 was considered significant.

Preoperative Selection and Postoperative Surveillance

The patients receiving post-traumatic spinal surgeries (transpedicular screw fixation, posterior decompression, and anterior cervical discectomy and fixation) were included in the study. Preoperatively, the patients were examined clinically, and X-rays were done to identify the level of injury, which was later confirmed on a CT scan of the spine at that specific level. Postoperatively, the patients were evaluated during the hospital stay, at discharge, and 3-month follow-up. Any intra-operative complications or iatrogenic injuries were also noted.

RESULTS

Age & Gender Distribution

The mean age of patients was 39.55±6.19 years. Out of 55 patients, 40 (72.7%) were male and 15 (27.3%) were female.

Clinical Information

The majority (40.0%) of the patients had a BMI >30. The main surgical procedure in the current study was transpedicular screw fixations (74.54%), with the main spinal injury distribution being thoracolumbar (74.54%). For more detail, see Table 2.

Table 2: Background information.

Demographic Variables		**N**	**%**
Age (years)	**Mean±SD**	**39.55±6.19**	
Gender	Male	40	72.7
	Female	15	27.3
BMI	<18.5	1	1.8
	18.5-24.9	11	20.0
	25.0-29.9	21	38.2
	≥30	22	40.0
Surgical procedures	Transpedicular screw fixations	41	74.5
	Posterior decompression	3	5.5
	Anterior cervical discectomy and fixation	11	20
Spine Injury Distribution	Cervical	11	20.0
	Thoracolumbar	41	74.5
	Sacral	0	0.0
	Dorsal	3	5.5

Comorbidities

The comorbidities results showed that 14.5% of patients had hypertension, 16.4% of patients had diabetes mellitus, 9.1% of patients had depression, 1.8% of patients had osteoporosis, 23.6% of patients had the habit of smoking and 5.5% had others (Table 3).

Table 3: Results of comorbidities.

Comorbidity	n	%
Hypertension	8	14.5
Depression	5	9.1
Diabetes Mellitus	9	16.4
Osteoporosis	1	1.8
Smoking	13	23.6
Others	3	5.5

Postoperative Complications

The results of complications of post-traumatic spinal surgery show us that 10.9% of patients had wound infection, 3.6% of patients had CSF fistula 1.8% of patients had wound dehiscence, 3.6% of patients had pneumonia, 1.8% of patients had heart arrhythmia, 1.8% patients had lung congestion, 1.8% patients had instrumental loosening, 1.8% patients had postoperative visual loss and 3.6% patients had burn. Overall complications observed in the current study were 30.9%. See Table 4 for more detail.

Table 4: Results of complications.

Complications		n	%
Specific	Wound Infection	6	10.9
	CSF Fistula	2	3.6
	Wound dehiscence	1	1.8
	Pneumonia	2	3.6
	Heart Arrhythmia	1	1.8
General	Myocardial infarction	0	0.0
	Lung congestion	1	1.8
	Postoperative visual loss	1	1.8
	Instrumental Loosening	1	1.8
Technical	Urinary tract issues	0	0.0
	Diathermy Burn	2	3.6

We also observed significant differences ($p<0.05$) between complications (present vs absent) and demographic variables like age ($p=0.041$), gender ($p=0.028$) and BMI ($p=0.021$).

Table 5: Comparison of demographic results with complications.

Demographic Variables		Complications		Total	p-value
		Present	Absent		
Age Groups	<45 years	10 58.8%	32 84.2%	42 76.4%	0.041*
	≥45 years	7 41.2%	6 15.8%	13 23.6%	
Gender	Male	9 52.9%	31 81.6%	40 72.7%	0.028*
	Female	8 47.1%	7 18.4%	15 27.3%	
BMI	<18.5	0 0.0%	1 2.6%	1 1.8%	0.021*
	18.5-24.9	2 11.8%	9 23.7%	11 20.0%	
	25.0-29.9	3 17.6%	18 47.4%	21 38.2%	
	≥30	12 70.6%	10 26.3%	22 40.0%	

*significant difference

DISCUSSION

Recent research has focused on the postoperative complications of spinal surgery since hospital expenses are being reduced and healthcare services are being improved.[13] Complications are a significant problem from a humanitarian perspective as well since they can lead to pain and worry for patients, their families, and doctors.[14] When compared to other doctors, it has been observed that surgeons have lower survival rates, which has been linked to stress.

In the current study, the average age of the patients was 39.556. 19 years, with 72.7% being male and 40.0% having a BMI greater than 30 kg/m^2. The main comorbidities observed were hypertension (14.5%), diabetes mellitus (16.4%), and depression (9.1%). Overall complications observed in the current study were 30.9%.

In a study by Reis et al., the age of patients was 59.00±12.00 years, with 45.00% being male and 43.00% having a BMI of 25.0-29.9. The main comorbidities include hypertension (38%), diabetes mellitus (7.37%), and depression (4.2%). Overall complications observed in their study were 26%. Degenerative disease (n = 64) was the most common cause of spinal disease, followed by neoplastic disease (n = 19) and trauma (n = 11). Patients who received instrumentation had a 33% (or 12 of 36) risk of complications, compared to 22% (or 13 of 59) among those who did not.[12] Overall complication rates are significantly higher in traumatic populations than in elective spinal surgeries (Table 2) for deep venous thrombosis/ pulmonary embolus (10%), major respiratory events (31%), major cardiac issues (18%), respiratory failure/tracheostomy (18%), and mortality (20.5%).[24] In our study, patients presented after trauma and underwent instrumentation, so this data supports it as there was a slightly increased risk of complications.

The post-operative complication rates of spinal surgery differ widely in the literature. Campbell et al, reported the complication rates were 52.0%, with a predominance of minor complications.[15] Retrospective studies reported a lower rate of problems than prospective studies, "16% vs. 19.9%," according to a systematic review of the literature.[16] In another study, Giovanni et al. reported complications in 107 (11.6%) patients of 917 spinal surgeries performed. The incidence of overall complications for trauma, infectious pathology, oncology, and degenerative disease was 22.2%, 19.2%, 18.4%, and 15.3%, respectively.[23] In our study's prospective design, the incidence of complications was 30.9%, with the main surgical procedure being transpedicular screw fixation (74.54%), and the main spinal injury distribution being thoracolumbar (74.54%).

Studies show that Obesity and advanced age have been linked to problems, but the majority of these studies were retrospective, and the results were inconsistent and diverse. [17] Based on a multivariate analysis of a prospective database of spinal surgical cases, Lee et al. reported that patients greater than 65 years old had a higher frequency of problems.[18]

Obesity has been linked to an increased rate of complications in spinal surgery in a few retrospective studies,[19] but in many prospective studies, they have not been able to show this connection.[20] Age, gender, and obesity were linked to a greater complication rate in the current study. A systematic evaluation of 105 studies, the majority of which were retrospective, on problems following spinal surgery was published by Nasser et al.[16] Most studies that looked at correlations between complications and different factors focused on just one potential risk factor, like obesity, age, or comorbidities.[21] We did not assess surgical procedure-specific problems since doing so would have required more patients.

One of the uncommon but most dangerous side effects of spine surgery is postoperative visual loss, which can be caused by orbital edema compromising small arterioles or veins, direct orbital compression, hypotensive ischemia, or a combination of these.[22] In our study one of the

patients faced this complication. Intraoperative variables that can be changed to reduce the risk of POVL include head elevation (reverse Trendelenburg), avoiding anemia, hypotension, avoiding direct orbital compression, using colloids instead of crystalloids, and minimizing the amount of time spent during surgery.[22] Since there isn't a common definition of surgical complications in the literature, we adopted a broad definition of complications in this study; because our sample came from a tertiary referral institution, the sample size was limited. Since the surgeon's lack of experience can be a risk factor for problems, the procedures (transpedicular screw fixations, posterior decompression, and anterior cervical discectomy and fixation) were carried out in a hospital with a residency program, which may have increased our rate of complications. Clustered data from numerous prospective research may disclose the true prevalence of problems in spinal surgery until big, multicenter studies are carried out.

Limitation and Recommendation

Postoperative complications in patients with spinal fractures have been less studied topics in Pakistani local settings. Long cohort studies and a large data sample would be sufficient to adequately convey these complications. It will provide clarification and spur future progress in the management of post-traumatic spinal fractures that these patients are predisposed to.

CONCLUSION

In the current study, 30.9% of patients developed complications and we concluded that these complications caused long hospital stays and increased suffering. Also concluded that Age, BMI, and gender were linked with an increased risk of complications.

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Additional Information

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AUTHORS CONTRIBUTIONS

Sr.#	Author's Full Name	Intellectual Contribution to Paper in Terms of:
1.	Mohammad Daniyal Mumtaz	1. Study design and methodology.
2.	Iram Bokhari	2. Paper writing.
3.	Tanweer Ahmed	3. Data collection and calculations.
4.	Raheel Gohar	4. Analysis of data and interpretation of results.
5.	Sanam Daniyal	5. Literature review and referencing.
6.	Sehrish Altaf	6. Editing and quality insurer.