

# Emergency Laparotomies Under Spinal Anesthesia: A Retrospective, Facility Based Observational Study, in Kabul, Afghanistan

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## Research article

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# Abstract

## Background

Laparotomy is most commonly performed under general anesthesia, but spinal anesthesia (SA) is considered an alternative to in the context of limited resources. The safety and efficacy of using SA as substitute for GA has not been explored in Afghanistan.

## Methodology

We conducted an observational study in the general surgery department of Isteqlal hospital in Kabul, Afghanistan on 196 adult patients undergoing emergency laparotomy under spinal anesthesia between April 2018-April 2020.

## Results

The mean age of patients was 41.5 years (SD=19.4), the ratio of males to females was 1.9:1 and almost half (44.4%) had comorbidities. 21% were classified as ASA grade III and IV with a similar pattern among males and females. 11 (5.6%) cases were converted to GA. Conversion pattern to GA was similar among males and females (P=0.71), ASA grade (P=0.432) and age group (P=0.642). The mean length of stay after operation was 6.5 days (SD=4.1). 32 (16.3%) patients suffered SA complications with no significant difference in according to sex (P=0.134). Hypotension and headache accounted for 97% of complications. Complication rates were similar in terms of intervertebral level (P=0.349), type of abdominal incision (P>0.1) and average length of stay (P=0.156). 18 patients (9.2%) died due to MOF, sepsis, respiratory failure, thromboembolism and cardiogenic shock.

## Conclusion

SA is considered a safe and effective anesthesia for emergency laparotomies, even for those with comorbidities. Based on our findings we would recommend SA as an alternative to GA in emergency laparotomy in Afghanistan.

## Background

Commonly, laparotomy is performed under general anesthesia (GA), but in some low- and middle- income countries the lack of adequate human, technical and financial resources limits the use of GA for this purpose. An alternative to GA is regional anesthesia (RA) (spinal/epidural), which has been successfully used for abdominal operations. (1) Spinal anesthesia (SA) was advocated for emergency operations in the 1930s. (2) More recently, Kateregga et al. in their prospective study demonstrated that laparotomy performed under lumbar SA was safe and effective, and no complications were observed in their study. (3)

GA and intubation have the advantage of secured airway, but can lead to dependency on mechanical ventilation and effects such as bronchospasm, V/Q mismatch and atelectasis, and residual anesthetic or muscle relaxant effects. Additionally, GA has the highest postoperative pulmonary morbidity and mortality in upper abdominal operations due to reduced functional pulmonary residual capacity in the early postoperative period. In contrast, these effects are reduced in RA as it improves diaphragmatic function and chest wall compliance by decreasing chest wall muscle tone. (1) Rodgers et al. showed in a meta-analysis that overall mortality and other serious complications were reduced in neuraxial blockade. Altered coagulation, breathing without pain, and reduced surgical stress response have been indicated as beneficial RA mechanisms to patients. (4)

Evidence shows that RA has minimal respiratory effects even at higher level blocks, and emergency laparotomy can be safely done under SA, especially in high risk patients. (5) Utilization of SA for emergency abdominal surgery has been reported in high risk cases including uncontrolled hyperthyroidism and severe myasthenia gravis. (6, 7)

Laparoscopic procedures, including laparoscopic cholecystectomy, can also be safely performed under RA, with benefits such as reduced emesis and postoperative pain, as reported by Collins et al. Advantages of SA include no risk of intubation-related airway complications, little risk of unrecognized hypoglycemia in a diabetic patient, excellent muscle relaxation, decreased surgical bed oozing, and a more rapid return of bowel function, especially in old patients or those suffering from systemic diseases. (8, 9, 10)

Unlike GA, RA does not require aerosol generating procedures such as intubation, and thus minimizes the transmission risk of airborne infections to anesthesia and operating teams, especially in low-income countries, where proper and adequate protection is not often available. In addition, use of SA in mildly symptomatic COVID-19 patients so far is demonstrated to be safe, and according to S. A. Lie et al, RA theoretically reduces postoperative pulmonary complications in COVID-19 patients, especially those patients whose respiratory function is reduced due to pneumonia or acute respiratory distress syndrome. (11, 12)

GA requires qualified anesthesiologists/anesthetists, adequate equipment and supplies, as well as thorough perioperative care, which are lacking in most provincial and district health facilities in the Afghanistan. Due to this constraint, surgeons in these facilities often refer such patients to regional or national hospitals. This can result in treatment delays and increased morbidity and mortality.

In this study, we aimed to determine the safety and feasibility of SA for emergency laparotomy in the current context of Afghanistan to provide evidence for health policy makers to consider SA as an alternative to GA for emergency laparotomy in order to reduce referral of emergency patients, and thus reduce morbidity and mortality due to treatment delays.

## Methods

### Study design

We conducted an observational retrospective study in the general surgery ward of Isteqlal hospital – a tertiary health facility in Kabul, Afghanistan. In this study, data were collected from the general surgery department patient files through a questionnaire designed for this purpose.

### **Study Population and Sample**

Our study population consisted of 196 patients for whom emergency laparotomy had been performed under SA in the general surgery department of Isteqlal Hospital in the period April 2018-April 2020.

### **Variables and Data Collection**

The data were extracted from medical records into a structured questionnaire specifically developed for this study, and entered into a database developed based on that questionnaire using IBM SPSS 25. Demographic data as well as surgery, anesthesia and outcome related variables were recorded in the questionnaire.

### **Data analysis**

Data were analyzed using IBM SPSS 25. We conducted descriptive statistics including frequencies, and percentages and performed statistical tests including chi-square test and ANOVA to assess associations.

## **Results**

The demographic, medical history, and surgical characteristics of patients undergoing emergency laparotomy under spinal anesthesia in this study are summarized in Table 1.

Table 1  
Emergency Laparotomy under Spinal Anesthesia

Variable	N	(%)	Variable	N	(%)
<b>Sex</b>	129	(65.8)	<b>Comorbidity</b>	25	(28.7)
Male	67	(43.2)	Hypertension	13	(14.9)
Female			DM II	18	(20.6)
			Recent major operation	12	(13.7)
			COPD		
<b>Age (years)</b>	63	(32.1)	<b>Common Pathology</b>	71	(36.2)
Up to 25	39	(19.9)	General Peritonitis	70	(35.7)
26–40	45	(23.0)	Bowel Obstruction	20	(10.2)
41–55	23	(11.7)	Acute biliary conditions	16	(8.2)
56–65	26	(13.3)	Local peritonitis	15	(7.7)
66 and higher			Abdominal injuries		
<b>ASA Grade</b>	96	(49.0)	<b>Incisions</b>	116	(59.1)
I	59	(30.1)	Full midline	42	(21.4)
II	31	(15.8)	Lower midline	21	(10.7)
III	10	(5.1)	Upper paramedian	10	(5.1)
IV			Upper midline		
			<b>Intervertebral level</b>	160	(81.6)
			L <sub>1</sub> -L <sub>2</sub>	36	(18.4)
			L <sub>3</sub> -L <sub>4</sub>		

The mean age of our study participants was 41.5 (SD = 19) years. The ratio of males to females was ~ 2:1. Both males and females had similar mean age and age group structure (Table 1).

Almost half (n = 87; 44.4%) of patients had comorbidities the most common being hypertension (28%), COPD (14%), diabetes mellitus type II (16%) and recent major operation (19.5%). In patients with comorbidities, 30% had more than one comorbidity. 41% of males and 51% of females had comorbidities, and comorbidity increased with age in both sexes (P < 0.001).

Emergency laparotomy under spinal anesthesia was most commonly done for general peritonitis (36%), bowel obstruction (36%), acute biliary conditions (10%), local peritonitis (8%) and abdominal injuries (8%). More than half of laparotomies were performed with a full midline incision (59%), followed by lower

midline (21%), upper paramedian (~ 11%) and upper midline (5%). While most of these incisions (76%) lie in dermatome T<sub>6</sub>, which require a higher level of spinal anesthesia, there was no statistically significant difference in the complication rate between high or low abdominal incisions using chi-square test ( $P > 0.100$ ).

Almost 80% ( $n = 96$ ; 79%) of patients were in the ASA (American Society of Anesthesiology) grade I and II categories, and a substantial proportion ( $n = 41$ ; 21%) had a suboptimal condition before surgery (ASA grade III and IV). ASA grades showed similar patterns according to patient sex ( $P = 0.157$ ) and average length of stay after operation ( $P = 0.331$ ).

The anesthetic drug used in our hospital for spinal anesthesia is Bupivacaine 15 mg. In 160 cases (~ 82%), anesthetic drug was injected at L2-L3 intervertebral level, and for the remaining cases L3-L4 level was used. In 165 cases (84.2%), Bupivacaine alone was used to anesthetize the patient. For the remaining 31 cases (16%) additional drugs were used (see Table 2). The additional drug usage along with SA was similar between male and female patients ( $P = 0.868$ ), but it was significantly higher among those aged over 65 years ( $P < 0.05$ ).

Table 2  
Additional Drugs Used in SA for Emergency  
Laparotomies

Drug Name	N	(%)
Ephedrine	16	(8.2)
Benzodiazepine + Pentazocine	8	(4.1)
Pentazocine	5	(2.6)
Aminophylline	1	(0.5)
Hydrocortisone	1	(0.5)
<b>Total</b>	<b>31</b>	<b>(15.9)</b>

For 185 (94.4%) cases, spinal anesthesia was adequate until the conclusion of operation (closure of the abdomen and applying antiseptic dressing). In 11 cases (5.6%) it was converted to GA, the most common indication being prolonged operation (2.5 hours or more). Conversion to GA pattern was similar in terms of gender ( $P = 0.71$ ), ASA classification ( $P = 0.432$ ) and age group ( $P = 0.642$ ).

The average length of stay after operation was 6.5 days (1–30 days) ( $SD = 4.1$ ), with most (88%) staying for up to 10 days in the hospital after operation. There was no significant difference in mean length of stay between cases with or without SA complications ( $P = 0.215$ ).

Complications associated with SA were observed in 32 (16.3%) patients (18 male, 14 female), where hypotension (~ 90/60 mmHg) and headache were the most common complications. One patient had urinary retention which was relieved by urinary catheterization (see Table 3).

Table 3  
Spinal Anesthesia Complications

<b>SA Complications</b>	<b>N</b>	<b>(%)</b>
hypotension and headache	13	(6.6)
Hypotension	12	(6.1)
Headache	6	(3.1)
urinary retention	1	(0.5)
<b>Total</b>	<b>32</b>	<b>(16.3)</b>

A total of 18 patients (9.2%) died, 16 (88%) of whom had comorbidities. Causes of death are outlined in Table 4.

Table 4  
Mortality

	<b>N</b>	<b>(%)</b>
MOF	6	(3.1)
Sepsis	4	(2.0)
Respiratory failure	3	(1.5)
Thromboembolism	3	(1.5)
Cardiogenic shock	2	(1.0)
<b>Total</b>	<b>18</b>	<b>(9.1)</b>

## Discussion

Our study has demonstrated that SA is a safe and effective alternative to GA for emergency laparotomies, for use in the context of an urban tertiary hospital in Afghanistan.

SA has minimal respiratory effects even at higher level blocks, and emergency laparotomy as well as elective operations can be safely done under SA, especially for laparotomies in high risk patients. (2, 5) In our study, most of the incisions were located in the upper abdomen (dermatome T<sub>6</sub>), which requires higher level block, and there was no statistically significant difference in complication rate among high or low abdominal incisions, i.e. SA was safe and effective for virtually all abdominal surgeries.

Overall mortality and other serious complications such as deep vein thrombosis, pulmonary embolism, myocardial infarction, transfusion requirements, pneumonia, other infections, respiratory depression, and renal failure are reduced in neuraxial blockade. (4) Our study confirms this: while nearly half of our patients had comorbidities, there were no deaths directly attributed to SA. Furthermore, SA complications

that occurred were mild and managed successfully. Other studies (1, 5) observed lower complication rates, but the number of cases in these studies were also small. Our study had a larger number of cases, and thus the complication and mortality rate were slightly higher. The complication rate was similar for both sexes, but higher in critical and elderly patients. The average length of stay after operation was also slightly (1.5–2.5 days) higher in our study, but was not affected by SA complications.

Although 9% of patients in our study died, this was not a direct result of the SA as almost all these patients had serious underlying co-morbidities on admission. A randomized clinical trial to compare safety and effectiveness of SA vs GA in emergency laparotomies will provide stronger evidence for this purpose.

## **Conclusion**

In summary, we found that SA is a safe and effective anesthesia method for emergency laparotomies in our setting, even for those with higher ASA grades and comorbidities, for both sexes. Based on our findings, we would recommend SA to be considered an alternative to GA for emergency laparotomies in health facilities in Afghanistan and other similar resource constrained contexts where GA is not available or possible due to lack of human and technical resources.

This was a single center study in a major urban center, and the results are limited to this center. However, this is the first study on this issue conducted in Afghanistan and provides the first evidence that SA is safe and effective alternative to GA for emergency laparotomy in this context.

## **Abbreviations**

SA: Spinal anesthesia; RA: Regional anesthesia; GA: General anesthesia; MOF: Multi organ failure; COPD: Chronic obstructive pulmonary disease; DM II: Diabetes mellitus type II; ASA: American Society of Anesthesiology; COVID: Corona virus disease.

## **Declarations**

### **Ethics approval and consent to participate**

This study has been approved by the Institutional Review Board (IRB) of the Ministry of Public Health of Afghanistan under IRB code No. A.1219.0119. Data were obtained from Health Management Information System (HMIS) department of Isteqlal hospital after approval of the hospital director and head of HMIS. As the data provided were de-identified, individual consent was deemed unnecessary by the IRB, Afghanistan Public Health Institute, Ministry of Public Health of Afghanistan.

### **Consent for publication**

Not applicable.

## Availability of data and materials

Available from the corresponding author upon request.

## Competing Interests

The authors declare that there is no conflict of interest in this paper.

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No funding was received.

## Authors' Contributions

WF analyzed and interpreted the data, wrote the first draft and revision of the manuscript, AN contributed in the concept, data acquisition and questionnaire development. Both authors read and approved the final manuscript.

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## Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [QuestionnaireEmLapSpinalIsteqlalWaisFarda1.pdf](#)