

## ORIGINAL RESEARCH

# Traumatic hip surgery: Clinical study to evaluate the relationship between intra-operative hypotension and post-operative complications

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### ABSTRACT

**Background:** Recent research in non-cardiac surgery has examined the link between intra-operative hypotension and post-operative problems. About this connection in traumatic hip surgery, little is known. Our research intended to learn more about this connection. **Objective:** To ascertain how postoperative problems in these individuals relate to intraoperative hypotension along with the evaluation of the connection between post-operative problems and delayed operation, anaesthetic type, and intra-operative blood transfusion. **Methods:** Retrospective research was done on patients who had their traumatic hip fractures surgically corrected. We looked at 122 individuals' perioperative blood pressure values and instances of intraoperative hypotension. Hypotension was defined as a prolonged drop in blood pressure of at least 30% from the pre-induction level for at least 10 minutes. It was assessed how intra-operative hypotension and problems following surgery interacted. New occurrences or illnesses that required post-operative care for 48 hours were referred to as post-operative complications. Type of anaesthesia, blood transfusion rate, pre-operative comorbidities, and delay in surgery were among the variables examined. **Results:** Data from 122 patients who undergone various kinds of traumatic hip surgery were examined. 67 patients (54.9%) acquired intraoperative hypotension, and of these 67 patients, 38 (56.7%) experienced postoperative problems. Compared to patients with stable vital signs, individuals with hypotension experienced post-operative problems much more frequently (56.7% vs. 34.5% P 0.01). Patients having general or spinal anaesthesia experienced the same rate of post-operative complications, with no statistically significant differences. There was no discernible connection between pre-operative comorbidities and post-operative problems. Both intra-operative hypotension and post-operative problems were linked to intra-operative blood transfusion. **Conclusion:** In patients undergoing traumatic hip surgery, there was a correlation between intra-operative hypotension and post-operative problems.

**Keywords:** Traumatic hip injury, Post-operative complications, Hypotension, Surgery

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### INTRODUCTION

Hip fracture dislocation caused by high-energy trauma is a rather uncommon injury. The majority of these wounds require surgical repair. Hip dislocation requires reduction within 6 to 8 hours of the initial trauma since it is an orthopaedic emergency. A hip fracture occurs when the femur's upper portion fractures. A fall or automobile accident are the usual causes of the injury, which frequently has a considerable long-term morbidity. A common form of

treatment for traumatic hip fractures is surgery, which promotes early mobilisation and lowers the risk of complications like infections and pulmonary emboli. Significant blood loss is common during surgery for severe hip fractures, and intra-operative hypotension is possible [1].

Although hip surgery can reduce pain and increase mobility, it can also be fatal and have significant postoperative medical issues [2]. Contrary to hip replacement, patients who undergo surgery for a hip

fracture are at significantly higher risk of mortality and medical problems [3]. The older age and comorbidities of hip fracture patients may be the cause of the elevated risk [2]. Although the higher risk of a bad result among patients receiving hip fracture surgery may be explained by patient characteristics, it's also likely that physiological processes related to hip fracture may contribute to some of the elevated risk [4]. These procedures could be a contributing role in some perioperative morbidity and mortality, making them potentially modifiable risk factors. This comprises the blood pressure, acute inflammation, stress, hypercoagulable, and catabolic states. Due to the prevalence of heart, pulmonary, and other concomitant conditions in patients with hip fractures, their American Society of Anesthesiologists (ASA) physical status is typically III or higher. Despite prompt surgical fracture repair, about 8% of patients pass away at 1 month and 30% at 1 year after surgery. 20% of patients are thought to experience one or more post-operative problems [6].

When treating hip fractures, hypotension frequently develops, particularly in elderly patients with more concomitant conditions [7]. In non-cardiac surgery, intra-operative hypotension is significantly associated with mortality [8]. In 89% of patients undergoing hip fracture surgery, intraoperative hypotension was noted, according to a prospective observational study [9]. In non-cardiac surgery, the risk of postoperative heart and kidney injury increases when intraoperative MAP is reduced by less than 50-60 mmHg for 1–30 min or by 20–50% of pre-operative MAP for 5 min [10]. Lowest absolute intraoperative blood pressure readings have been linked to higher 5- and 30-day mortality in prospective hip fracture data from the UK [11]. Additional research in numerous surgical populations demonstrates a link between postoperative organ dysfunction and prolonging intraoperative hypotension [12].

There is currently no information linking cumulative intraoperative hypotension duration to postoperative morbidity in patients having hip fracture surgery. In patients undergoing traumatic hip surgery, the connection between intra-operative hypotension and post-operative problems has not been sufficiently investigated. Therefore, the main goal of this study is to ascertain how postoperative problems in these individuals relate to intraoperative hypotension. The secondary goal is to evaluate the connection between post-operative problems and delayed operation, anaesthetic type, and intra-operative blood transfusion.

## **MATERIALS AND METHODS**

### **STUDY DESIGN**

At our tertiary referral hospital, a retrospective analysis was performed on patients who had hip fracture surgery over the previous two years. Informed permission was not required because the study was a retrospective observational one and there was no intervention.

## **INCLUSION AND EXCLUSION CRITERIA**

All patients under the age of 20 who underwent surgery for a unilateral acute femur neck or intertrochanteric fracture were included. Bilateral hip fracture, pathological hip fracture, numerous fractures, prior hip fracture surgery, and femur shaft fracture were among the exclusion criteria.

## **RECORDING OF DEMOGRAPHIC CHARACTERISTICS**

We reviewed the records of patients who underwent dynamic hip screws, intramedullary nails, and partial hip replacements under spinal or general anaesthesia. Age, gender, hospital stay duration, and operation postponement were among the characteristics that were accessible. The number of days from admission to discharge made up the length of stay. The number of days from the time of admission and the start of the surgical repair of the hip fracture was used to determine surgery delay. Hypertension, diabetes mellitus, cardiovascular issues, chronic respiratory conditions, renal disease, and other ailments were among the comorbidities identified in the patient population.

## **PRIMARY OBJECTIVE**

In this study, the primary objective was to determine the association between intra-operative hypotension and post-operative problems that occurred within 48 hours following the conclusion of surgical treatment for a hip fracture. When the arterial catheter was in place, the intraoperative blood pressure was checked continuously. When the non-invasive technique was employed, it was checked every 2.5–5 minutes. Systolic blood pressure readings were taken every five minutes from the patients' medical records, where we obtained the blood pressure data. Hypotension in this study was defined as any prolonged preoperative drop in systolic blood pressure of at least 30% for at least 10 minutes. Before either the spinal block or the commencement of general anaesthesia, we used the preoperative systolic blood pressure measurement as the reference. New occurrences or illnesses that required treatment within 48 hours after surgery were referred to as post-operative complications.

## **SECONDARY OBJECTIVE**

The study's secondary goal was to investigate the relationships between intra-operative hypotension and patient comorbidities, intra- and post-operative blood transfusion, anaesthetic type, and the interval before surgically correcting a hip fracture.

## **STATISTICAL ANALYSIS**

For statistical analysis, we used Chicago, USA-based SPSS version 23.0. For continuous variables (such age), we used mean  $\pm$  standard deviation, while for nominal variables, we used count (frequency). To examine how the study's variables differed from one

another, we used the Chi-square test.  $P < 0.05$  was chosen as the significant threshold.

**RESULTS**  
**DEMOGRAPHICS**

Demographic characteristics for patients is presented in Table 1. 145 hip fracture procedures in total were performed during the study period. Following exclusion and in accordance with the availability of necessary records, 122 patients were qualified for study enrollment. 54 male patients were present. 16 patients had an ASA physical status score of I, 41 had a score of II, 55 had a score of III, and 10 had a score

of IV. Patients were  $64 \pm 7.5$  years old on average. For their procedure, 81 patients underwent general anaesthesia and 41 had spinal blocks. Seventy patients (57.4%) had surgery within 24 hours after being admitted to the hospital, while the remaining patients got surgery within two days of being admitted. Hypertension, diabetes mellitus, cardiovascular disease, chronic obstructive pulmonary disease, renal disease, and other comorbidities were among the comorbidities reviewed in the study. The most prevalent comorbidity was hypertension (58.2%) followed by diabetes (51.6%).

**Table 1: Demographic characteristics**

Characteristics	All patients (n=122)	Hypotensive patients (n=67)
Age (years)	64±7.5, 20-88	68.3±8.1 (range 28-83)
Hospital stay (days)	9.1±4.1, 3-22	10.4±5.7 (range 3-35)
<b>Gender</b>		
Male	54	31
Female	68	36
<b>Comorbidities</b>		
Diabetes Mellitus	63 (51.6)	32 (47.7)
Hypertension	71 (58.2)	34 (50.7)
Cardiovascular disorders	42 (34.3)	22 (32.9)
Chronic obstructive pulmonary disease	24 (19.7)	8 (11.9)
Renal failure	13 (10.6)	4 (6.0)
Other medical illness	31 (25.4)	13 (19.4)
<b>Types of anaesthesia</b>		
General	81 (66.4)	27 (40.3)
Spinal	41 (33.6)	21 (31.4)
Vasopressors	34 (27.9)	36 (56.7)
Post-operative complications	16 (13.11)	26 (38.8)

**POST-OPERATIVE COMPLICATIONS**

Thirty-four patients had post-operative problems, and 103 patients overall had comorbidities (Table 2). There was intraoperative hypotension in 67 cases (Table 1). Hypotension lasted anywhere from 12 to 170 minutes on average. To manage intra-operative hypotension, 62 patients needed vasopressors. In the first 48 hours following surgery, 26 patients experienced

complications, including post-operative bleeding, diabetic ketoacidosis, cerebrovascular accident, kidney injury, cardiac arrhythmias, myocardial ischaemia, and kidney damage [Table 3]. Significantly more patients with hypotension developed post-operative complications than those with stable vitals (18.7% vs. 6.1;  $P < 0.001$ ) [Table 3].

**Table 2: Co-morbidity and post-operative complications**

No. of comorbidity	No. of patients	Post-operative complications (n)
1	44	5
2	30	9
3	14	12
4	9	6
5	6	2

**Table 3: Incidence of complications in hypotensive and normotensive patients**

Complications	Stable vitals group (n=55)	Hypotension group (n=67)
Decrease LOC	2	6
AFib with RVR	2	3
Myocardial Ischaemia	4	2
CVA	2	4
Acute Kidney Injury	4	5
Pulmonary Embolism	1	6

Allergic Reaction	1	3
Bleeding and haemoglobin drop	1	4
DKA	2	5
<b>Total</b>	<b>19 (34.5%)</b>	<b>38 (56.7)</b>

**CORRELATION OF HYPOTENSION AND POST-OPERATIVE COMPLICATION**

Blood transfusions were given to 56 percent of the hypotensive patients and to 73.7% (42 out of 57) of the patients who had post-operative problems [Table 4]. Post-operative problems occurred more frequently in patients with a surgical delay of 3 days (43.3%) than in patients with a delay of 1 day (22.4%) [Table 4]. Blood transfusions were administered to 38 out of

67 patients with intra-operative hypotension compared to 4 out of 55 patients with stable vital signs. Compared to patients who did not get blood transfusions, more patients who did [Table 4] experienced post-operative problems. The incidence of complications following surgery did not change statistically significantly between spinal and general anaesthesia.

**Table 4: Relationship between haemodynamics, surgery delay and blood transfusion and the incidence of post-operative complications**

Variables	Post-operative complications	P
Haemodynamics		<0.01
Stable vitals (n=55)	19 (34.5%)	
Hypotension (n=67)	38 (56.7)	
Surgery delay (n=67)		<0.001
0-1 day	15 (22.4%)	
2-3 days	23 (34.3%)	
>3 days	29 (43.3%)	
Blood transfusion		<0.001
No	Stable: 51 (92.7) Hypotension: 29 (43.9)	
Yes	Stable: 4 (7.8) Hypotension: 38 (56.7)	

**DISCUSSION**

It is well established that intra-operative hypotension is a significant risk factor for the development of post-operative complications, particularly in the heart and kidneys. Patients who experienced intra-operative hypotension were more likely to experience post-operative problems. A sustained drop in blood pressure of less than 30% from its pre-induction level was referred to as hypotension. In comparison to using set chosen values, the definition of intra-operative hypotension related to the patient's baseline blood pressure provides a better post-operative risk assessment on the poor outcome [13]. The majority of the patients in this study were elderly and had an ASA physical status of III. According to the number of comorbidities, they were categorised, but no statistically significant link between the number of comorbidities and intra-operative hypotension was discovered. Since pre-operative comorbidities cannot be changed, it is necessary to optimise severe anomalies rather than treat them. Anaesthetic care of hip fracture patients revealed no evidence of postponing surgical repair of hip fractures in order to better control patient comorbidities [14].

The kind of anaesthetic had no impact on the frequency of intraoperative hypotension, as far as we could tell. Regarding intraoperative and postoperative problems, there isn't a definite benefit of one

anaesthesia approach over another (general vs. spinal) [15]. Our findings, which are in line with a number of previous publications, show a correlation between the frequency of postoperative problems and the delay of surgery by more than 24 hours. Numerous studies demonstrate that postponing surgery beyond 48 hours after admission lengthens hospital stays and increases the risk of complications and mortality [16,17]. Severe anaemia, severe electrolyte disruption, uncontrolled heart failure, and diabetes are known causes of postponing surgery. More danger may result from these disorders than from the postoperative consequences.

Both intra-operative hypotension and post-operative problems were connected to blood transfusions. The question of when to transfuse blood and at what haemoglobin level to do so is still being debated.

We conclude that hypotension during hip fracture surgery compared to normotensive cohort may lead to a higher risk of post-operative complications which might be due to delay in surgery and blood transfusion but may not be associate with anesthesia used during the surgery. Further studies are needed in larger population to establish the correlation more firmly.

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