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Comparison of Regional and General Anesthesia Outcome after Peripheral Vascular Surgery

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Abstract **Original Research Article**

Background: Compared to other non-cardiac surgical procedures, peripheral vascular surgery is more likely to cause cardiac morbidity and mortality. Planning anesthesia and surgery for open vascular procedures on the lower limbs necessitates a careful examination of the patient's physical capacity and, ideally, includes cardiac and pulmonary evaluation and, if possible, optimization. ***Methods:*** An investigation of relationships between anesthesia approach and outcomes of 436 cases (GA=218 and RA=218) was provided by this retrospective, propensity score matched, cohort study. Between May 2019 and July 2021, the study was carried out at the Department of Anaestheology in National Institute of Cardiovascular Diseases and Dhaka Medical College Hospital. ***Result:*** In both groups most of the patients (80.7% and 84.4%) were aged less than 80 years. Male participants were more prevalent (57.8% and 60.6%) in both groups. In the GA group, the frequency of both general and surgical problems was considerably higher. The GA group experienced significantly more general medical problems than the control group, including post-operative hemorrhage (1.4% vs. 0.9%), ICU >3 days (0.9% vs. 0.5%), cardiac (2.8% vs. 2.3%), and pulmonary (1.4% vs. 0.9%). After multiple regression analysis, the GA group had a significantly higher 30-day mortality rate and greater instances of all complications. The incidence of general and surgical problems was 6.9% and 3.7%, respectively, and the total 30-day mortality was 3.2%. The average length of stay was 5 (3, 9). The overall one-year amputation rate for the same side was 8.3%. ***Conclusion:*** This study highlighted the possibility that RA, as opposed to GA, may be associated with a better outcome following open inguinal and infra- inguinal vascular surgery.

Keywords: Peripheral Vascular Surgery, Regional Anesthesia, General Anesthesia.

INTRODUCTION

Atherosclerosis is a chronic illness that affects the heart, brain, and kidneys, among other organ systems. Critical ischaemia and, in the worst circumstances, gangrene are possible outcomes of atherosclerosis of the lower limbs [1, 2]. Compared to other non-cardiac surgical procedures, peripheral vascular surgery is more likely to cause cardiac morbidity and mortality. Due to the comorbidity in this patient population and the characteristics of the condition, which include ischaemia reperfusion and the possibility of substantial blood loss, surgical artery revascularization is regarded as a high risk surgery [3]. Planning anesthesia and surgery for open vascular procedures on the lower limbs necessitates a careful examination of the patient's physical capacity and, ideally, includes cardiac and pulmonary evaluation and, if possible, optimization [4]. However, in many instances, the diagnosis is urgent ischaemia, the surgery is limb-saving, and there is little time for patient pre-optimization. In individuals who have advanced age and cardiovascular comorbidity, general anesthesia (GA) may not be the best option [5, 6]. Positive pressure ventilation has an adverse effect on pulmonary physiology and hemodynamics, which can lead to atelectasis and a perfusion/ventilation mismatch. Additionally, GA may have a deleterious impact on blood pressure and microcirculation. Regional ischaemia, which can lead to problems like poor wound healing, thrombotic events, graft failure, and, in the worst cases, organ dysfunction, may be caused by

decreased tissue perfusion. Neuraxial blockades and peripheral nerve blocks, which involve the spinal, epidural, or peripheral instillation of local anesthetics, are examples of regional anesthesia (RA). The evidence in favor of neuraxial anesthesia versus GA is still ambiguous [8, 9]. Neuraxial blockades are contraindicated in patients using anticoagulants (for instance, due to dysrhythmias, thrombosis, or mechanical heart valves) [10]. Peripheral nerve blocks are being utilized more frequently as an option in vascular surgery [11-13]. This retrospective study's objective was to assess how GA and RA affected patient outcomes following open inguinal and infra-inguinal arterial reconstruction surgery.

OBJECIVE OF THE STUDY

The objective of this retrospective study was to evaluate the effect of GA and RA on outcome after open inguinal and infra-inguinal arterial reconstruction surgery.

MATERIALS AND METHODOLOGY

An investigation of relationships between anesthesia approach and outcomes of 436 cases (GA=218 and RA=218) was provided by this retrospective, propensity score matched, cohort study. Between May 2019 and July 2021, the study was carried out at the Department of Anaestheology in National Institute of Cardiovascular Diseases and Dhaka Medical College Hospital. The vascular surgeon in charge of the patient recorded all information and submitted it to the NICVD and DMCH Vascular Registry. Any procedures where the debate between GA and RA was pertinent were covered (open arterial revascularisations where RA alone would be sufficient for surgery). From a clinical standpoint, covariates were chosen, including those that have previously been identified as risk factors [14, 15]. Anaesthesia with regulated mechanical ventilation was referred to as GA. GA was classified as GA when combined with adjunctive RA. Airway management was not a part of RA; only spinal, epidural, and peripheral nerve blocks were used. Diabetes, a prior stroke or transient ischaemia of the cerebral cortex, hypertension, cardiac illness (past myocardial infarction, ischemic heart disease, valvular disease, and dysrhythmias), and pulmonary disease are all included in the comorbidity. The hospital's ethical review committee granted the ethical approval. The statistical program SPSS version 20 was utilized to analyze the data.

RESULT

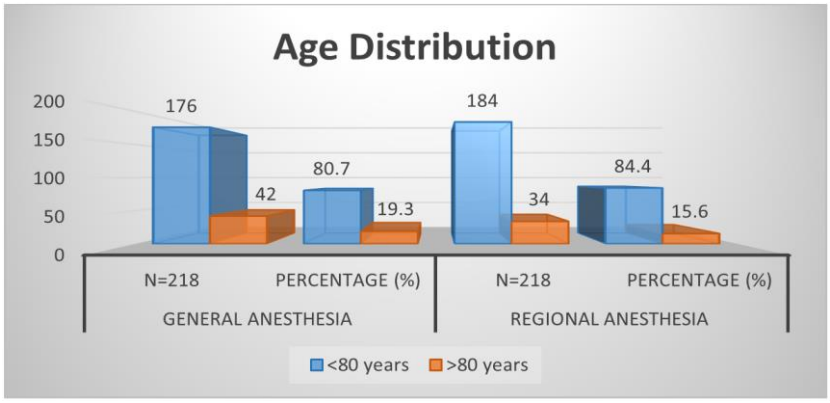

Figure 1: Age distribution of the respondents

In both groups most of the patients (80.7% and 84.4%) were aged less than 80 years.

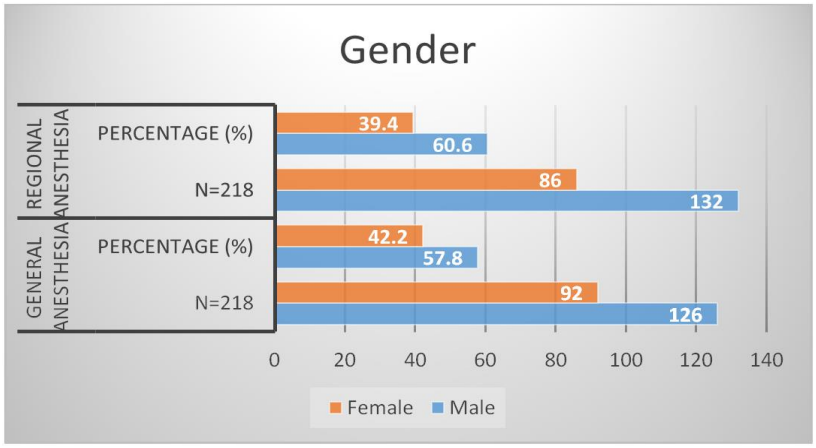

Figure 2: Gender distribution of the respondents.

Male participants were more prevalent (57.8% and 60.6%) in both groups.

Table 1: Clinical Presentation of the study patients

Clinical Presentation		General Anesthesia		Regional Anesthesia		P-value
		N=218	Percentage (%)	N=218	Percentage (%)	
Charlson Comorbidity Score	Low	19	8.7	17	7.8	
	Moderate	87	39.9	86	39.4	
	Severe	112	51.4	115	52.8	<0.001
ASA physiology score III-V		89	40.8	89	40.8	
Comorbidity	Cerebrovascular	16	7.3	15	6.9	
	Cardiac	202	92.7	203	93.1	
Pulmonary comorbidity	COPD	21	9.6	22	10.1	
	History of dyspnoea	9	4.1	12	5.5	
	Anticoagulant medication	34	15.6	37	17.0	
Surgery	Emergency (performed within hours)	14	6.4	12	5.5	
	Urgent (performed within days)	42	19.3	43	19.7	
	Elective	162	74.3	163	74.8	
Indication for surgery	Acute ischaemia	18	8.3	17	7.8	
	Claudication	54	24.8	55	25.2	
	Rest pain	44	20.2	42	19.3	
	Ulceration or gangrene	79	36.2	80	36.7	
	Other indication	23	10.6	24	11.0	<0.001
Procedure type	TEA	59	27.1	60	27.5	
	Bypass	83	38.1	84	38.5	
	Other	76	34.9	74	33.9	
Blood loss e mL		225 (100, 410)		200 (100, 400)		<0.001
Duration of surgery e min		131 (95, 180)		125 (93, 180)		<0.001

Cardiovascular comorbidity was more common in the GA and RA groups (92.7% and 93.1%, respectively). In both groups, more patients (15.6% and 17%) received anticoagulant treatment than usual. Surgery indications differed throughout the groups, and more GA and RA patients (74.3% and 74.8%) required elective surgery. As a result, both groups had higher rates of ulceration or gangrene (36.2% and 36.7%, respectively).

Table 2: Post-operative complications of the study patients

Post-operative complications	General Anesthesia		Regional Anesthesia		P-value
	N=218	Percentage (%)	N=218	Percentage (%)	
Cardiac	6	2.8	5	2.3	0.002
Pulmonary	3	1.4	2	0.9	0.002
Cerebrovascular event	1	0.5	1	0.5	
Acute renal failure, need for dialysis	2	0.9	1	0.5	
ICU >3 days	2	0.9	1	0.5	0.001
Compartment syndrome	1	0.5	1	0.5	
Peripheral nerve lesion	2	0.9	1	0.5	
Peripheral embolisation	1	0.5	1	0.5	
Bleeding, requiring surgery	3	1.4	2	0.9	0.003
Wound infection	3	1.4	2	0.9	
Wound necrosis	3	1.4	3	1.4	
Wound lymphocele/-lymphorrhoea	18	8.3	15	6.9	
Wound haematoma	7	3.2	6	2.8	

In the GA group, the frequency of both general and surgical problems was considerably higher. The GA group experienced significantly more general medical problems than the control group, including post-operative hemorrhage (1.4% vs. 0.9%), ICU >3 days (0.9% vs. 0.5%), cardiac (2.8% vs. 2.3%), and pulmonary (1.4% vs. 0.9%).

Table 3: Outcome among the study patients

Outcome	General Anesthesia		Regional Anesthesia		P-value
	N=218	Percentage (%)	N=218	Percentage (%)	
30 day mortality	7	3.2	6	2.8	
1 y amputation rate	18	8.3	16	7.3	
Wound complications	35	16.1	34	15.6	
General complications	15	6.9	13	6.0	<.001
Surgical complications	8	3.7	7	3.2	<.001
Length of stay, days	5 (3, 9)		5 (3, 8)		

After multiple regression analysis, the GA group had a significantly higher 30-day mortality rate and greater instances of all complications. The incidence of general and surgical problems was 6.9% and 3.7%, respectively, and the total 30-day mortality was 3.2%. The average length of stay was 5 (3, 9). The overall one-year amputation rate for the same side was 8.3%.

DISCUSSION

A considerably higher 30-day mortality and complication rate was shown in this open inguinal and infrainguinal artery revascularization technique when GA was used instead of RA. A subset of the current study cohort, consisting of 3,202 patients undergoing open artery revascularization of the lower leg, was examined by Kehlet *et al.*, in 2016 [14]. One or more problems were experienced by one-third of patients. At 30 days, the death rate was 5%, and at 1 year, it was 15%. 19% had lost their limbs or died after a year. They identified age, female gender, comorbidities, urgent surgery, and GA as independent risk variables; the only modifiable component was anaesthetic type. The current investigation confirmed that GA appears to have a deleterious impact on outcome and used data spanning one year. Sgroi *et al.*, provided data from 15,997 patients receiving infra-inguinal bypass surgery from 2011 to 2016 in a retrospective study from the Vascular Quality Initiative [9]. It's interesting to note that just 3.5% of patients had RA, and this ratio fell from 4.6% in 2011 to 2.6% in 2016, with center variability varying from 0% to 30%, during the study period. Despite having a smaller number of patients, the RA group showed signs of lower mortality (1.1 vs. 2.2%, p 14.07), shorter lengths of stay, and lower rates of acute congestive heart failure and acute renal injury. The selection of anesthesia from a clinical standpoint is influenced by a number of factors. Because of the anticipated difficulty of the procedure, the length of the surgery, and the desire to avoid the potentially more time-consuming procedure with RA prior to surgery, both the anesthetist and the surgeon may prefer GA in acute surgery. The anesthesia staff might not have much regular experience with vascular surgery and would rather use GA. The possibility of insufficient peripheral nerve blocks may also have an impact on the choice [16]. As a result, GA is frequently used to undertake acute surgery. The increased 30-day mortality and complication rate in the GA group was corroborated by the current study, which employed multiple regressions to account for these differences. There was no difference in result between RA and GA, according to Ghanami *et al.*, study.'s of a cohort of 5,462 patients undergoing elective infra-inguinal bypass surgeries [17]. Only 13% of surgeries were covered by RA, yet 37% of them had complications. In the GA group, they discovered higher trainee surgical engagement, transfusion demand, and operating time—findings that would point to more intricate surgical techniques. However, due to comorbidities and the severity of the disease, a quick treatment may potentially be linked to poor outcomes and have no chance of revascularization. Additionally, although femorocrural bypass takes a long time to do, the blood loss is typically minimal. To account for these variances, the present statistical model includes the type of procedure and the urgency of the surgery. By preventing the haemodynamic instability that GA can cause, cardiac problems may be avoided [18]. In the current study, cardiac problems were observed in 2.8% and 2.3% of patients, respectively, and were noticeably more frequent in the GA group. After an epidural or spinal blockade, the likelihood of developing a neuraxial hemorrhage ranges from 1:168 000 to 1:190 000 [19]. Anticoagulant drugs, platelet inhibitors, and low weight molecular heparin were administered to more patients in the GA group, which dramatically raises this risk. The propensity score matching model used in the current investigation took the use of these drugs into account. Unfortunately, there is no information available regarding the therapy's indication or if the medicine was stopped prior to surgery. Avoiding mechanical ventilation might improve the result. In 2,644 patients with severe chronic obstructive pulmonary disease (COPD) undergoing a range of surgical procedures, Hausman *et al.*, showed that using RA compared to GA decreased the complication rate, risk of pulmonary infection, prolonged length of mechanical ventilation, and unplanned post-operative intubation [20]. The RA group in the current study had a higher proportion of patients with dyspnea and COPD, indicating that RA was preferred in this patient group. Although the overall pulmonary complication rate was only 1.4%, the post-GA group was shown to have considerably greater post-operative pulmonary problems. In some cases, peripheral nerve blocks are preferable to neuraxial anesthesia. Epidural analgesia was linked to higher cardiovascular morbidity, according to a post hoc analysis from a sizable, randomized trial [21]. The benefit of peripheral nerve blocks is that they can be

administered in patients who are on anticoagulant therapy and who have significant cardiac comorbidities such aortic stenosis. In a study by Yazigi *et al.*, who randomly assigned 50 patients undergoing peripheral vascular surgery to get peripheral nerve blocks (combined sciatic and femoral nerve blocks), they discovered that the RA group had a lower incidence of intraoperative cardiac ischaemia [11]. Peripheral nerve blocks may also be able to lessen persistent pain that develops after surgery [22]. However, when utilizing RA in peripheral artery disease, the potential of peripheral nerve injury and masking of severe ischaemia must be recognized. The frequency of peripheral nerve injury did not change. Compartment syndrome and amputation cases were more common in the GA group, although this was not represented in the propensity score matched analysis, and it may have more to do with how severely the limbs were ischaemic than with the anesthetic used. Investigating the occurrence and progression of peripheral nerve blocks over the course of the 1-year study period would have been instructive. As anticoagulant drugs are used more frequently, neuraxial blockade procedures are becoming less common. However, peripheral nerve block techniques have become a more common component of routine anaesthetic practice in many institutions throughout the course of this time. Unfortunately, the NICVD and DMCH Vascular Registry does not provide information on the distribution of peripheral and neuraxial nerve blocks.

CONCLUSION

Only that avoiding GA might be advantageous can be inferred from the results of the current investigation. In comparison to RA, GA was linked to a significantly greater 30-day mortality rate as well as more surgical and general complications. There were no changes in the rates of wound complications, one-year amputations, or length of stay. The incidence of all problems and 30-day mortality were considerably higher in the GA group. Amputation rate and length of stay were unaffected. This study highlighted the possibility that RA, as opposed to GA, may be associated with a better outcome following open inguinal and infra-inguinal vascular surgery. But GA can still be regarded as safe in a clinical setting when RA is not practical. These findings indicate that large-scale randomised clinical trials comparing the effects of GA and RA on outcomes are necessary and that such trials are both safe and morally acceptable.

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