

## Impact of General Anaesthesia Versus Combined Epidural and General Anesthesia on Postoperative Complications and Mortality in Elective Abdominal Aortic Aneurysm Surgeries

Khan Muhammad Yaqub, Muhammad Saeed, Bilal Yasin, Khalid Ameer, Nusrat Noor

Combined Military Hospital/National University of Medical Sciences (NUMS) Rawalpindi Pakistan

### ABSTRACT

**Objective:** To determine the impact of general anaesthesia versus combined epidural and general anaesthesia on postoperative complications in elective abdominal aortic aneurysm surgeries.

**Study Design:** Quasi-experimental study.

**Place and Duration of Study:** Combined Military Hospital, Rawalpindi Pakistan, from Jun 2018 to Sep 2020.

**Methodology:** A total of 100 patients from both genders undergoing elective open abdominal aortic aneurysm surgery under general anaesthesia enrolled in the study after random distribution to drug and control groups in equal proportions. The primary determinants were postoperative complications. Additionally, it determined the impact on postoperative mortality rate.

**Results:** Of 100 participants, 54% of patients were from ASA status II, and 46% were from ASA status III. Among postoperative complications, bowel ischemia was recorded in 16% and 2% among Group-A and Group-B, respectively ( $p$ -value 0.01). Postoperative dialysis was required in 18% of patients in Group-A, whereas among Group-B, only 4% went through it ( $p$ -value 0.02). Pulmonary complications variation was not statistically different between the two groups, with 54% and 46% ( $p$ -value 0.42) frequencies in Group-A and Group-B, respectively. However, surgical reintervention within 30 days was notable, 36% in Group-A and 14% in Group-B ( $p$ -value 0.01).

**Conclusion:** Combined general and epidural anaesthesia, when compared with general anaesthesia alone, significantly impacts the reduction of postoperative complications after elective open abdominal aortic aneurysm surgeries without increasing morbidity and mortality.

**Keywords:** Abdominal aortic aneurysm, Anaesthesia, Complications, Epidural anaesthesia.

**How to Cite This Article:** Yaqub KM, Saeed M, Yasin B, Ameer K, Noor N. Impact of General Anaesthesia versus Combined Epidural and General Anesthesia on Postoperative Complications and Mortality in Elective Abdominal Aortic Aneurysm Surgeries. *Pak Armed Forces Med J* 2023; 73(2): 405-408. DOI: <https://doi.org/10.51253/pafmj.v73i2.7422>

This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<https://creativecommons.org/licenses/by-nc/4.0/>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

### INTRODUCTION

Abdominal aortic aneurysm (AAA) is a prevalent condition with an approximate incidence of 4–7%, commonly affecting the age group of 65–74 years with a greater propensity for the male gender.<sup>1,2</sup> Elective open abdominal aortic aneurysm surgeries have highly reported morbidity and mortality due to postoperative complications. Postoperative morbidity is estimated to be 12%–26%.<sup>3,4</sup> A significant mortality statistics of 4–6% are associated with this major surgery.<sup>5,6</sup> Effective postoperative pain management with epidural anaesthesia (EA) can contribute to preventing complications owing to the modulatory impact on sympathetic response due to vasodilatation resulting in raised perfusion of viscera and reduction in afterload.<sup>7,8</sup> Physiological advantages provided by epidural anaesthesia and analgesia led to a hypothesis on moderation of cardiac, pulmonary, renal, bowel ischemia, and

neurologic complications after elective open abdominal aortic aneurysm surgeries.<sup>9,10</sup>

The rationale of the study was to determine the impact of general anaesthesia (GA) versus combined epidural and general anaesthesia on postoperative complications in elective abdominal aortic aneurysm surgeries and, additionally, determine postoperative mortality rate.

### METHODOLOGY

The quasi-experimental study was conducted at Combined Military Hospital, Rawalpindi Pakistan after approval of the Ethical Review Board from June 2018 to September 2020. The sample size was calculated using the WHO sample size calculator, taking the postoperative mortality rate due to complications after elective open abdominal aortic aneurysm surgery as 5.6%.<sup>11</sup>

**Inclusion Criteria:** Patients aged 55 to 75 years belonging to American Society of Anesthesiologists (ASA) Class-II, III undergoing open abdominal aortic

**Correspondence:** Dr Khan Muhammad Yaqub, Department of Anaesthesia, Combined Military Hospital, Rawalpindi Pakistan

Received: 23 Sep 2021; revision received: 02 Jan 2022; accepted: 05 Jan 2022

aneurysm surgery under general anaesthesia who provided informed written consent were included in the study.

**Exclusion Criteria:** Patients subjected to emergency surgery, mentally incapacitated, past pertinent history (e.g. allergy to the study epidural drug contents, coagulation disorders, thrombosis, chronic kidney disease), unwilling for epidural anaesthesia, having absolute contraindications to regional anaesthesia were excluded from the study.

With non-probability consecutive sampling, 100 participants were randomly distributed into two uniform groups Group-A (General Anesthesia) and Group-B (Combined Epidural & General Anesthesia). Pre-anaesthesia assessment was performed per guidelines (standard laboratory test, chest x-ray, echocardiography) before scheduling surgery and re-evaluated by a senior consultant anaesthetist on the day of surgery. Antiplatelet agents, Warfarin, and oral anticoagulants were stopped before surgery. To encounter thromboembolic events, 4000 units of Low molecular weight Heparin was prescribed once daily from the day before surgery until four weeks elapsed postoperatively. General anaesthesia is given to the patient per standard protocols after ensuring mandatory monitoring parameters. Induction was performed with intravenous Propofol (1.5-2.5mg per Kg), whereas maintenance was ensured with isoflurane and neuromuscular blocking agent atracurium. In addition, 5000 IU of unfractionated heparin was administered before the cross-clamp application. Transfusion of fresh frozen plasma was restricted for patients with INR >1.5, and packed red blood cells transfusion was instituted at Hemoglobin 8 gm/dl. At the end of the surgery, neuromuscular blockade was antagonized by Neostigmine+Glycopyrrolate. Patients were shifted toward after stabilization of vitals in the post-anaesthesia care unit. Early recovery and mobilization were ensured postoperatively.

Thoracic epidural catheter passed between T8-T10 under aseptic conditions after assuring the absence of contraindications in Group-B, whereas only general anaesthesia was provided to Group-A participants.

Data were analyzed using Statistical Package for the Social Sciences (SPSS) version 23.00. The descriptive statistics for the categorical variable were presented as frequency and percentage, while the mean and standard deviation were reported for continuous variables. The categorical groups were compared using the Chi-square test, while mean values were compared

using the Independent sample t-test. The *p*-value of  $\leq 0.05$  was considered significant.

## RESULTS

Of the 100 patients enrolled in the study, 93% were males, whereas seven 7% were females, with a mean age of  $65.33 \pm 6.98$  (55-75 years). Of 100 participants, 54% of patients were from ASA status II, and 46% were from ASA status III (Table-I).

**Table-I: Characteristics of Patients (n=100)**

Characteristics	Group-A (n=48)	Group-B (n=48)
Smoking	29(62.41%)	37(77.08%)
Hypertension	34(70.83%)	35(72.91%)
Diabetes Mellitus	5(12.5%)	4(8.33%)
Ischemic Heart Disease	14(29.16%)	15(31.25%)
Previous History of Transient Ischemic Attack or Stroke	3(6.25%)	3(6.25%)
Dyslipidemias	14(29.16%)	20(41.66%)
Chronic Kidney Disease	46(95.83%)	45(93.75%)

Among postoperative complications, bowel ischemia was recorded in 8(16%) and 1(2%) among Group A and Group B, respectively (*p*-value 0.01) (Table-II). Postoperative dialysis was required in 9(18%) patients in Group A, whereas among Group B, only 52(4%) went through it (*p*-value 0.02). Pulmonary complications variation was not statistically different between the two groups, with frequencies of 27(54%) and 23(46%) (*p*-value 0.42) in Group-A and Group-B, respectively. However, surgical reintervention within 30 days was notable, being 18(36%) in Group A and 7(14% in Group B (*p*-value 0.01). Data recorded for mortality are elaborated in Table-III.

**Table-II: Postoperative Complications in both Groups (n=100)**

Complications	Group-A (n=50)	Group-B (n=50)	<i>p</i> -value
Bowel Ischemia	8(16%)	1(2%)	0.01*
Postoperative Dialysis	9(18%)	2(4%)	0.02*
Pulmonary Complications	27(54%)	23(46%)	0.42
Surgical Reintervention within 30 days	18(36%)	7(14%)	0.01*

**Table-III: Mortality in both Groups (n=100)**

	Group-A (n = 50)	Group-B (n = 50)	<i>p</i> -value
Mortality (One year Follow up)	0	3(6%)	0.15
Postoperative Hospital Stay	6 $\pm$ 1.5	6 $\pm$ 1.2	-

## DISCUSSION

The results of this study demonstrated the superiority of combined general and epidural anaesthesia

over general anaesthesia alone in the prevention of overall morbidity and mortality after elective open abdominal aortic aneurysm surgery.

Salata *et al.* conducted a 90 days surveillance to compare general anaesthesia versus combined general and epidural anaesthesia to evaluate benefits regarding postoperative complications. They concluded a lower incidence of 18.9% in combined GA and EA versus 34.4% GA in terms of pulmonary complications, dialysis was recorded in 2.0% in GA and EA group whereas 3.3% in the GA Group only, findings compatible with this study results.<sup>12</sup>

Several proposed theories contribute to reducing postoperative complications after elective open abdominal aortic aneurysm surgeries when neuraxial anaesthesia and analgesia are employed. Adequate analgesia is an aid for convenient movement and prevents wound pain, thus the reduction in respiratory compromise.<sup>13</sup> Early mobility contributes to preventing respiratory failure, atelectasis, and pneumonia. Sympathetic outflow reduction resulting in renal vasodilation owing to the physiological influence of neuraxial anaesthesia is a likely mechanism in preventing acute kidney injury.<sup>14,15</sup>

Greco *et al.* analyzed the impact of epidural anaesthesia in preventing postoperative morbidity and mortality in elective abdominal aortic aneurysm surgeries. They concluded decreased incidence of reintervention and hospital readmission in the case of combined GA and EA (*p*-value 0.014) comparable to this study. However, no significant difference in postoperative pulmonary, cardiac, renal complications and mortality was noted, contradictory to the study under discussion.<sup>16</sup> Park *et al.* studied analgesia and postoperative pain control with an epidural block in patients undergoing elective open abdominal aortic aneurysm surgeries. They concluded a better outcome in pain management, reduction in intubation time, and intensive care unit stay time.<sup>17</sup>

An intervention of a balanced intraoperative and postoperative regimen for high-risk patients undergoing major vascular surgery, such as open abdominal aortic aneurysm repair, is still under question. However, in a third world poorly medical-resourced country, it is important to devise ways. It means reducing hospital stay, postoperative morbidity, mortality, and early rehabilitation protocols after surgery.<sup>18</sup> This study gives an insight into the achievement of the above using combined general and epidural anaesthesia. However, future studies with

larger sample sizes employing a multimodal approach must achieve a definitive conclusion.

#### LIMITATIONS OF STUDY

Morbidity and mortality at five years were not checked due limitation of resources and decreased duration of the study.

#### CONCLUSION

Combined general and epidural anaesthesia, when compared with general anaesthesia alone, significantly impacts the reduction of postoperative complications after elective open abdominal aortic aneurysm surgeries without increasing morbidity and mortality.

**Conflict of Interest:** None.

#### Author's Contribution

Following authors have made substantial contributions to the manuscript as under:

KMY: Conception, interpretation of data, drafting the manuscript, approval of the final version to be published.

MS: Study design, data analysis, drafting the manuscript, critical review, approval of the final version to be published.

BY.; KA: Study design, Drafting the manuscript, interpretation of data, approval of the final version to be published.

NN: Data acquisition, interpretation of data, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated & resolved.

#### REFERENCES

1. Tang Y, Chen J, Huang K, Luo D, Liang P. The incidence, risk factors and in-hospital mortality of acute kidney injury in patients after abdominal aortic aneurysm repair surgery. *BMC Nephrol* 2017; 18(1): 184. doi: 10.1186/s12882-017-0594-6.
2. Aziz F, Azab A, Schaefer E, Reed AB. Endovascular Repair of Ruptured Abdominal Aortic Aneurysm Is Associated with Lower Incidence of Post-operative Acute Renal Failure. *Ann Vasc Surg* 2016 ; 35: 147-155. doi: 10.1016/j.avsg.2016.01.021.
3. Soden PA, Zettervall SL, Ultee KH, Darling JD, McCallum JC, Hamdan AD, et al. Patient selection and perioperative outcomes are similar between targeted and nontargeted hospitals (in the National Surgical Quality Improvement Program) for abdominal aortic aneurysm repair. *J Vasc Surg* 2017 ; 65(2): 362-371.
4. Latz CA, Boitano L, Schwartz S, Swerdlow N, Dansey K, Varkevisser RRB, et al. Contemporary mortality after emergent open repair of complex abdominal aortic aneurysms. *J Vasc Surg* 2021 ; 73(1): 39-47.e1. doi: 10.1016/j.jvs.2020.03.059.
5. Salata K, Hussain MA, de Mestral C, Greco E, Aljabri BA, Mamdani M, et al. Comparison of Outcomes in Elective Endovascular Aortic Repair vs Open Surgical Repair of Abdominal Aortic Aneurysms. *JAMA Netw Open* 2019 ; 2(7): e196578. doi: 10.1001/jamanetworkopen.2019.6578.
6. Dovell G, Rogers CA, Armstrong R, Harris RA, Hinchliffe RJ, Mouton R. The Effect of Mode of Anaesthesia on Outcomes After Elective Endovascular Repair of Abdominal Aortic Aneurysm. *Eur J Vasc Endovasc Surg* 2020; 59(5): 729-738. doi: 10.1016/j.ejvs.2020.01.031.

7. Teixeira PG, Woo K, Abou-Zamzam AM, Zettervall SL, Schermerhorn ML, Weaver FA. The impact of exposure technique on perioperative complications in patients undergoing elective open abdominal aortic aneurysm repair. *J Vasc Surg* 2016; 63(5): 1141-1146. doi: 10.1016/j.jvs.2015.12.025.
8. Fairman AS, Chin AL, Jackson BM, Foley PJ, Damrauer SM, Kalapatapu V, et al. The evolution of open abdominal aortic aneurysm repair at a tertiary care center. *J Vasc Surg* 2020 ; 72(4): 1367-1374. doi: 10.1016/j.jvs.2019.12.039.
9. Hicks CW, Canner JK, Arhuidese I, Obeid T, Black JH 3rd, Malas MB. Comprehensive Assessment of Factors Associated With In-Hospital Mortality After Elective Abdominal Aortic Aneurysm Repair. *JAMA Surg* 2016; 151(9) :838-845. doi: 10.1001/jamasurg.2016.0782.
10. Arinze N, Farber A, Levin SR, Cheng TW, Jones DW, Siracuse CG, et al. The effect of the duration of preoperative smoking cessation timing on outcomes after elective open abdominal aortic aneurysm repair and lower extremity bypass. *J Vasc Surg* 2019; 70(6): 1851-1861. doi: 10.1016/j.jvs.2019.02.028.
11. Kim GS, Ahn HJ, Kim WH, Kim MJ, Lee SH. Risk factors for postoperative complications after open infrarenal abdominal aortic aneurysm repair in Koreans. *Yonsei Med J* 2011; 52(2): 339-346. doi: 10.3349/ymj.2011.52.2.333.
12. Salata K, Abdallah FW, Hussain MA, de Mestral C, Greco E, Aljabri B, et al. Short-term outcomes of combined neuraxial and general anaesthesia versus general anaesthesia alone for elective open abdominal aortic aneurysm repair: retrospective population-based cohort study. *Br J Anaesth* 2020 ; 124(5): 544-552. doi: 10.1016/j.bja.2020.01.018.
13. Bardia A, Sood A, Mahmood F, Orhurhu V, Mueller A, Montealegre-Gallegos M, et al. Combined Epidural-General Anesthesia vs General Anesthesia Alone for Elective Abdominal Aortic Aneurysm Repair. *JAMA Surg* 2016 ; 151(12): 1116-1123. doi: 10.1001/jamasurg.2016.2733.
14. Panaretou V, Toufektzian L, Sifaka I, Kouroukli I, Sigala F, Vlachopoulos C, et al. Postoperative pulmonary function after open abdominal aortic aneurysm repair in patients with chronic obstructive pulmonary disease: epidural versus intravenous analgesia. *Ann Vasc Surg* 2012; 26(2): 149-155. doi: 10.1016/j.avsg.2011.04.009.
15. Delis KT, Knaggs AL, Mason P, Macleod KG. Effects of epidural-and-general anesthesia combined versus general anesthesia alone on the venous hemodynamics of the lower limb. A randomized study. *Thromb Haemost* 2004; 92(5): 1003-1011. doi: 10.1160/TH04-04-0233.
16. Greco KJ, Brovman EY, Nguyen LL, Urman RD. The Impact of Epidural Analgesia on Perioperative Morbidity or Mortality after Open Abdominal Aortic Aneurysm Repair. *Ann Vasc Surg* 2020 ; 66: 44-53. doi: 10.1016/j.avsg.2019.10.054.
17. Park WY, Thompson JS, Lee KK. Effect of epidural anesthesia and analgesia on perioperative outcome: a randomized, controlled Veterans Affairs cooperative study. *Ann Surg* 2001 Oct; 234(4): 560-569. doi: 10.1097/0000658-200110000-00015.
18. Norris EJ, Beattie C, Perler BA, Martinez EA, Meinert CL, Anderson GF, et al. Double-masked randomized trial comparing alternate combinations of intraoperative anesthesia and postoperative analgesia in abdominal aortic surgery. *Anesthesiology* 2001; 95(5): 1054-1067. doi: 10.1097/0000542-200111000-00006.