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Case Series

Challenges and complications of using EZ™ bronchial blocker in minimally invasive coronary artery bypass grafting surgery: A case series

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ABSTRACT

We present a case series of challenges and complications of using Rusch EZ blocker™ (Teleflex Life Sciences Ltd., Athlone, Ireland), a specially designed semi rigid Y shaped bronchial blocker containing two inflatable cuffs. We describe fifteen different patients (out of eighty four attempted EZ blockers) undergoing MICS CABG, in whom we faced different technical difficulties and adverse effects while using EZ blocker. We report failed EZ blocker insertion due to anatomical reasons, misplaced blocker following insertion and also few manufacturer defects. We have also encountered hemodynamic instability and bronchial injury in small percentage of cases. The EZ blocker is an easy, safe and reliable device for lung isolation but clinicians must know, prevent and solve the unexpected associated troubles which can happen acutely during insertion or insidiously post endobronchial placement.

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1. Introduction

In minimally invasive coronary artery bypass grafting (MICS CABG) surgery, lung isolation is mandatory. Left lung needs to be isolated which can be achieved by either using a left double lumen tube (DLT) or a bronchial blocker (BB). Both DLT and BB have different advantages and problems associated with them.^{1,2} Sometimes correct placement of a DLT may be technically difficult and bears additional risk of trauma to the trachea and the bronchi.^{3,4} In our institute, we mostly used the EZ blocker. Apart from this, other blockers are also available like single cuff endobronchial blocker (for example, COOPDECH™, Diaken Medical Company Ltd., Japan, and the Arndt™ blocker, Cook Medical Inc. Bloomington, IN, USA, etc). These are placed under direct vision using a fibreoptic bronchoscope (FOB). The EZ-Blocker is a semi rigid endobronchial blocker made of polyurethane. It is 7-French

in outer diameter and 75-cm long. It has four lumens and is Y shaped (Figure 1). This blocker has two different colored (blue and yellow) 4cm long symmetrical distal extensions (Figure 2) Both have an inflatable cuff and a small central lumen and pressure line connected to the external blue and yellow colour balloons. Two proximal colour coded balloons of the blocker serve to inflate or deflate the cuffs. Two additional lumens at distal end are used for suction or oxygen insufflation into non-dependent lung. The EZ blocker is supplied with a multiport adaptor. This adaptor connects to the ventilator end of a single lumen tube (minimum diameter 7mm) and also allows introduction of a fibreoptic bronchoscope, or a suction catheter. Right deployment of the Y-shaped distal part usually needs a minimum of 4 cm distance from the distal end of the single lumen tube and the carina. The Y-shape helps the device to anchor onto the carina. Therefore, EZ Blocker poses less chance of secondary malposition compared to other blockers.^{5,6} Usually the EZ-blocker is considered as a user-

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friendly blocker for easy one lung ventilation.^{7–9} Several factors are described about the safety and efficacy associated with EZ blocker in the study done by Mourisse J.⁹ EZ blocker can be inserted via 7 mm single lumen tube, the blocker anchors the carina with 2 extensions causing less malposition, and one size (7 Fr) EZ blocker almost fits to all adults as compared to DLT.⁹ EZ blocker can also be used in difficult airway as compared to DLT. The incidence of sore throat and hematomas are more in DLT.⁹ However, in this case series we describe the different challenges and complications we encountered while using the EZ blocker for MICS CABG surgery.

2. Case Series

Last year (from August 2023 to July 2024) we attempted 84 EZ BBs placement for MICS CABG surgery. We excluded the difficult airway cases (Mallampati 4, needing video laryngoscope for intubation and requiring bougie) from our case series. We used an 8-8.5 size endotracheal tube for male patients and a 7-7.5 size endotracheal tubes for females. In all the cases, two pilot balloon cuffs were inflated and checked for air leaks before insertion. A silicone gel spray was applied on the distal ends for smooth insertion. After induction of general anaesthesia and endotracheal intubation with single lumen tube, the EZ-blocker was introduced through the multiport adapter until it reached and straddled at the carina. For adequate cuff seal, we used 7-10 ml of air under FOB (3.8 mm, Pentax EB-1170K, Breda, The Netherlands) guidance. The time duration ranged from introduction of single lumen tube to proper positioning of EZ blocker was 1-10 min. The position of the EZ blocker was checked and confirmed again by the FOB after right lateral position for surgery. All the blockers were done by the same anaesthetist with more than 10 years of experience in cardiac anaesthesia.

Out of the eighty-four attempted cases of EZ BB, fifteen cases we found to have various challenges and complications (Table 1).

These events happened within one hour of attempting the insertion of the EZ BB. In six cases (40%), we failed to insert the EZ BB, despite multiple attempts. Even after trying for about fifteen minutes, we could not introduce it. Two patients had some kind of swelling/hump in the main posterior tracheal wall and it was impossible to direct the blocker to the left main bronchus, instead both the lumens were entering in the right main bronchus. Therefore we opted for single cuff COOPDECH™ endobronchial blocker in those cases and it went in easily. In one case even COOPDECH™ blocker could not be introduced and we used the Arndt™ blocker to isolate left lung. In one case trachea was grossly deviated. In three other cases, the diameter of carina and main stem bronchus were relatively small and it was impossible to negotiate EZ BB as it did not get enough space to open its distal

ports adequately. We managed with the single lumen COOPDECH™ endobronchial blocker in those three cases.

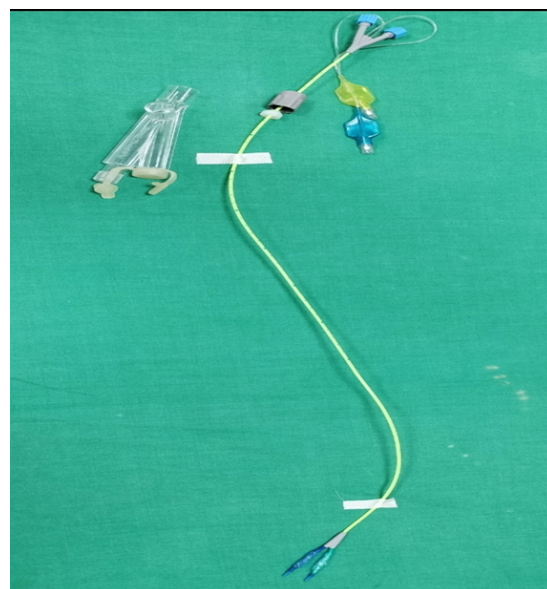


Figure 1: Full assembly of EZ blocker

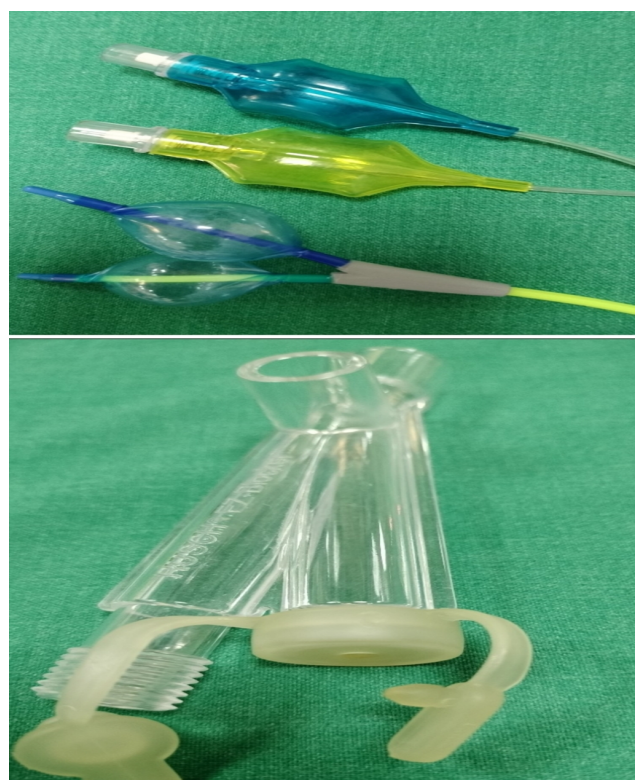


Figure 2: Balloons and cuffs and multiport adaptor of EZ blocker

In two cases (13.3%) there was desaturation and bradycardia while attempting EZ BB insertion. We analyzed that in one case it was because we took pretty long time

Table 1: Patient characteristics and challenges and complications of EZ blocker

Number of cases (Total 15 numbers)	Characteristics	Procedure	Challenges/complications	Management
06 (40%)	71 year male 72 year male 48 year male 56 year male 67 year male 68 year male	MICS CABG	Failed EZ BB introduction (Tracheal swelling/hump, deviation of trachea, small trachea and bronchus).	Managed with single balloon COOPDECH™ endobronchial blocker and Arndt™ blocker.
02(13.3%)	84 year male 47 year male	MICS CABG	Hemodynamic instability (Desaturation, bradycardia, asystole).	CPR, Sternotomy
02(13.3%)	57 year female 67 year male	MICS CABG	Cuff leak and inflation of nondependent left lung.	Manipulated and switched the other balloon to the left, change to a different BB.
01(6.6%)	75 year male	MICS CABG	Inadvertent inflation of right cuff.	Repeated inflation/deflation of left balloon or change BB. Reported to vendor.
01(6.6%)	72 year male	MICS CABG	Slipped inflated bronchial cuff to trachea causing loss of tidal volume.	Reposition BB.
02(13.3%)	67 year male 65 year male	MICS CABG	Failed to completely isolate left lung because wide carina causing oblique placement of EZ BB into main bronchus. Partially inflated left lung.	Change to a single balloon BB, or intermittent ‘lung down’ technique.
01(6.6%)	55 year male	MICS CABG	Bronchial injury by tip of EZ BB.	Careful and gentle introduction of EZ BB.

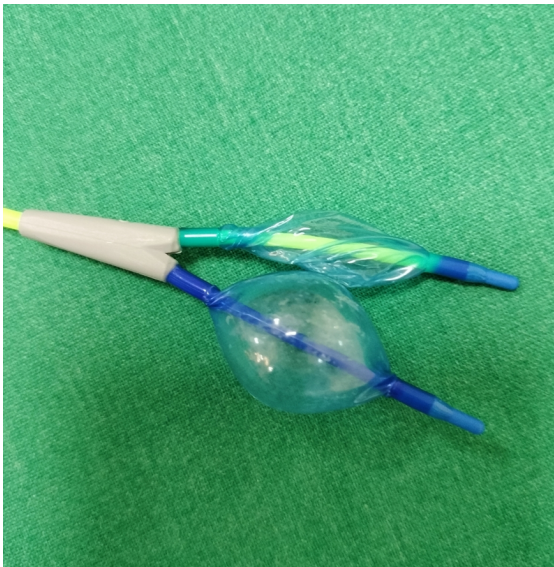


Figure 3: Cuff leak of EZ blocker

while attempting to put the blocker due to which he may have had hypoxia and hypercarbia. While there was one patient who had a cardiac arrest within 30 seconds of attempt and we had to start CPR, patient recovered and eventually a conventional sternotomy was performed. We analyzed that it could be related to manipulation of trachea

that would have caused an exaggerated vagal response. The patient had uneventful recovery later on.

In the other two cases (13.3%), after approximately one hour of surgery the surgeon complained of inflated non-dependent lung. Although the position of the EZ BB was perfect, we were surprised to notice that there is a left cuff leak. (Figure 3). This could be possibly attributed to the manufacturer defect. We inspected the cuff but no obvious macro damage was evident. The other balloon was functioning well. We reported to the vendor. In one case we could manage to rotate the normal good cuff to the left without removing it to proceed for the surgery and in the other case we could not manipulate to place the other cuff so we removed the EZ blocker and placed the single lumen COOPDECH™ endobronchial blocker.

In another case (6.6%), after about half an hour the surgeon again complained of inflation of the non-dependent lung. During this time the end tidal CO2 started increasing with high peak pressure and desaturation. Cuff integrity was normal this time. But upon checking with FOB, we found the right balloon is partially inflated while left one is deflated. We found and checked that while insufflating air in the left cuff, there was slow and gradual inflation of right balloon as well. It was perhaps a manufacturer defect, which may have been caused by a fistula between two balloons. We repeatedly deflated and inflated the left balloon to manage this case. We reported this to the vendor as well.

In one case (6.6%) after half an hour, we suddenly faced a loss in the tidal volume and peak airway pressure was very high. Immediate FOB was done and it was found that the left inflated balloon has migrated to the trachea and was causing airway obstruction. It was repositioned immediately. This displacement of left cuff happened after extra retraction of chest by surgeons.

In couple of cases (13.3%), in spite of correct placement of the EZ BB, we failed to completely isolate the left lung (even after insufflating 12 ml of air in left main bronchial balloon). This was caused by wide thick carina with large main stem bronchus, making the position of the balloon oblique in bronchus lumen causing some leak into left bronchus. The left lung remained partially inflated and the surgeon managed by intermittent 'lung down' technique.

In one case (6.6%), after taking out the bronchial blocker we found blood tinged mucous attached to the left balloon with a small clot. Careful examination by fiberoptic bronchoscope showed minor injury to the bronchus probably by the distal tip of the blocker. The bronchial and tracheal toileting was done eventually.

3. Discussion

In this case series, we describe the different types of challenges of insertion of the EZ BB and also the complications associated with it. Complications associated with the use of BBs are fairly known and in most of the cases they are related to improper position of the BB. Typically it manifests quite rapidly but sometimes slow and late. The bifurcated Y shaped design of EZ blocker is thought to deliver more positional stability. Till date not too many challenges and complications have been reported in literature. J. Dillemans reported a case series on technical failure of EZ BB, which was caused by fistula formation between two cuffs and caused serious adverse effect during one lung ventilation.¹⁰ The airflow between two cuffs depends on the diameter and length of fistula and a pressure gradient between them. Bharuka et al. reported a similar case and confirmed the fistula between cuffs using a dye.¹¹ Zorien M van de pas reported a case of bronchial perforation by EZ blocker.⁷

In our case series we report fifteen cases (out of total eighty four attempted EZ BB insertion) where we faced challenges. Our case report includes difficult and failed EZ blocker placement, displaced EZ blocker and also difficulties caused due to manufacturer defects. We have mentioned about trauma to bronchus by the tip of EZ blocker and a case of inadequate left lung isolation because of the oblique placement of the cuff in the left bronchus. In our experience, EZ blocker is a safe, easy and reliable blocker and quality of lung isolation is comparable to DLT.¹² The potential limitations and disadvantages of EZ blocker as reported by Rispoli in his study are lower aspiration and lower CPAP efficiency as compared to DLT, steeper learning curve than other bronchial blockers, only

one size available (7Fr) and more expensive than other blockers..¹³ EZ Blocker can be used in selective lobar exclusion^{14,15} or tracheostomy patients.^{16–18} It is very useful in sequential OLV in thoroscopic sympathectomy or bilateral thoracic surgeries.¹⁹ One case has been reported regarding entrapment of EZ blocker in Murphy eye.²⁰ As compared to the systemic review²¹ conducted by Piotr Palacznski et al. the incidence of hoarseness and sore throat are less in this study. That recent study by Piotr Palacznski reported incidence of hoarseness and sore throat as 13% and 23.3% respectively. Vigilance and experience of the operator are the key factors to potentially detect and troubleshoot the problems. Although only a few discrete case reports have been published in literature about complications of EZ blocker, but we in our case series have well demonstrated the variety and incidence (%) of challenges and complications we faced (includes new unreported complications and few previously reported complications also). We hope that this case series of ours will raise awareness among the anaesthesiologists and clinicians to know the difficulties and the range of adverse effects associated with EZ blockers, so that they can diagnose them early and prevent fatal outcomes. As EZ blocker is a relatively new blocker in India, this case series will help practitioners with the knowledge of this case series so that they readily anticipate and tackle the known challenges and complications. We conclude that EZ blocker is a safe and reliable device for lung isolation in hands with good clinical expertise.

4. Conclusion

Our case series highlighted the wide range of challenges and adverse events associated with the EZ blocker and how we managed each case. EZ blocker is a safe and reliable endobronchial blocker but sometimes may cause trivial to major complications.

5. Source of Funding

None.

6. Conflict of Interest

None.

References

1. Clayton-Smith A, Bennett K, Alston RP, Adams G, Brown G, Hawthorne T, et al. A Comparison of the Efficacy and Adverse Effects of Double-Lumen Endobronchial Tubes and Bronchial Blockers in Thoracic Surgery: A Systematic Review and Meta-analysis of Randomized Controlled Trials. *J Cardiothorac Vasc Anesth*. 2015;29(4):955–66.
2. Neustein SM. The use of bronchial blockers for providing one-lung ventilation. *J Cardiothorac Vasc Anesth*. 2009;23(6):860–8.
3. Knoll H, Ziegeler S, Schreiber JU, Buchinger H, Bialas P, Semyonov K, et al. Airway injuries after one-lung ventilation: a comparison

- between double-lumen tube and endobronchial blocker: a randomized, prospective, controlled trial. *Anesthesiology*. 2006;105(3):471–7.
4. Fitzmaurice BG, Brodsky JB. Airway rupture from double-lumen tubes. *J Cardiothorac Vasc Anesth*. 1999;13(3):322–9.
 5. Narayanaswamy M, Mcrae K, Slinger P, Dugas G, Kanellakos GW, Roscoe A. Choosing a lung isolation device for thoracic surgery: a randomized trial of three bronchial blockers versus double-lumen tubes. *Anesth Analg*. 2009;108(4):1097–101.
 6. Kus A, Hosten T, Gurkan Y, Akgul AG, Solak M, Tokar K. A comparison of the EZ-blocker with a Cohen Flex-Tip blocker for one-lung ventilation. *J Cardiothorac Vasc Anesth*. 2014;28(4):896–9.
 7. Pas J, Woude M, Belgers HJ, Hulsewe KW, Loos ERD. Bronchus perforation by EZ-Blocker™ endobronchial blocker during esophageal resection after neoadjuvant chemoradiation -a case report. *Korean J Anesthesiol*. 2019;72(2):184–7.
 8. Ruetzler K, Grubhofer G, Schmid W, Papp D, Nabecker S, Hutschala D, et al. Randomized clinical trial comparing double-lumen tube and EZ-blocker for single-lung ventilation. *Br J Anaesth*. 2011;106(6):896–902.
 9. Mourisse J, Liesveld J, Verhagen A, Rooji GV, Heide SVD, Schuurbiers-Siebers O, et al. Efficiency, efficacy, and safety of EZ-blocker compared with left-sided double-lumen tube for one-lung ventilation. *Anesthesiology*. 2013;118(3):550–61.
 10. Dillemans J, Gompel CV, Wouters P, Vanpeteghem C. Technical failure of the EZ-blocker™ causing serious adverse events during one lung ventilation: a case series. *Anaesth Rep*. 2022;10(1):e12160.
 11. Bharuka A, Rayani BK, Naik V, Konduri S. An unusual complication during lung isolation with RUSCH EZ-blocker® – A case study. *Indian J Anaesth*. 2024;68(2):205–6.
 12. Végh T, Juhász M, Enyedi A, Takács I, Kollár J, Fülesdi B. Clinical experience with a new endobronchial blocker: the EZ-blocker. *J Anesth*. 2012;26(3):375–80.
 13. Rispoli M, Nespoli MR, Ferrara M, Rosboch GL, Templeton LB, Templeton TW, et al. A Practical Guide for Using the EZ-Blocker Endobronchial Blocker: Tips and Tricks After 10 Years of Experience. *J Cardiothorac Vasc Anesth*. 2023;37(10):1884–93.
 14. Galata M, Lyberis P, Bisciaio A, Ceraolo E, Rosboch GL, Ruffini E, et al. The efficacy of endobronchial blocker “EZ-blocker” for selective lobar ventilation: case report. *Curr Chall Thorac Surg*. 2020;2:19.
 15. Cedrone M, Rosboch GL, Ceraolo E, Balzani E, Brazzi L. Selective Lobar Exclusion in Robot-Assisted-Thoracic Surgery Using EZ Blocker. *J Cardiothorac Vasc Anesth*. 2022;36(8):3221–3.
 16. Matei A, Bizzarri FT, Preveggenti V, Mancini M, Vicchio M, Agnoletti V, et al. EZ-Blocker and One-Lung Ventilation via Tracheostomy. *J Cardiothorac Vasc Anesth*. 2015;29(3):32–3.
 17. Rispoli M, Nespoli MR, Salvi R, Corcione A, Buono S. One-lung ventilation in tracheostomized patients: our experience with EZ-Blocker. *J Clin Anesth*. 2016;31:288–90.
 18. Moritz A, Irouschek A, Birkholz T, Prottengeier J, Sirbu H, Schmidt J. The EZ-blocker for one-lung ventilation in patients undergoing thoracic surgery: clinical applications and experience in 100 cases in a routine clinical setting. *J Cardiothorac Surg*. 2018;13(1):77.
 19. Temel U, Kaya S, Yucesoy SF, Türk H, Ediz N. Usage of EZ-blocker on bilateral videothoracoscopic sympathectomy. *J Cardiothorac Vasc Anesth*. 2013;27(6):71–2.
 20. Tang J, Merritt RE, Essandoh M. Entrapment of an EZ-Blocker in the Murphy Eye of an Endotracheal Tube. *J Cardiothorac Vasc Anesth*. 2019;33(10):2873–4.
 21. Palaczynski P, Misiolek H, Szarpak L, Smereka J, Pruc M, Rydel M. Systematic Review and Meta-Analysis of Efficiency and Safety of Double -Lumen Tube and Bronchial Blocker for One-Lung Ventilation. *J Clin Med*. 2023;12(5):1877.

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