One Lung Anesthesia for Infants, a Case Series

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INTRODUCTION

Lung isolation options are limited in infants since endobronchial and Univent® tubes are too large for smaller children. Use of Arndt blockers has been published for older pediatric patients (1) and in older infants (2). Limited data have been published in smaller infants utilizing side-by-side hand assembled uncuffed tubes (3).

We report our experience using one lung ventilation on 11 infants, **less than 10 kg**, using either an Arndt blocker or a conventional ET tube. Adequacy of ventilation, oxygenation, and lung isolation were studied.

METHODS

For **left** thoracotomy, the smallest Arndt bronchial blocker(5F) was first inserted 2 cm past the vocal cords and a half-sized smaller, uncuffed, ET tube was placed through the cords **adjacent to the blocker (extraluminal)** (4). A 2.2 mm Olympus® LFP bronchoscope was then inserted **through the ET tube** to manipulate the blocker into the left mainstem bronchus. The blocker cuff was inflated slowly under direct vision.

For **right** thoracotomy, a conventional, one-half sized smaller, cuffed, ET tube was inserted then guided into the left mainstem bronchus with the 2.2 mm bronchoscope. Ventilator settings were pressure controlled, 20-24 cmH_2O, rate 20-24 per minute, with an FIO_2 from 0.5-1.0. Patients received dexamethasone 0.2 mg/kg. An arterial blood gas was drawn 15 minutes after turning to the lateral position. Standard ASA monitors were used. If desaturation to 90% occurred, lung isolation efforts were stopped and standard two lung ventilation resumed temporarily.

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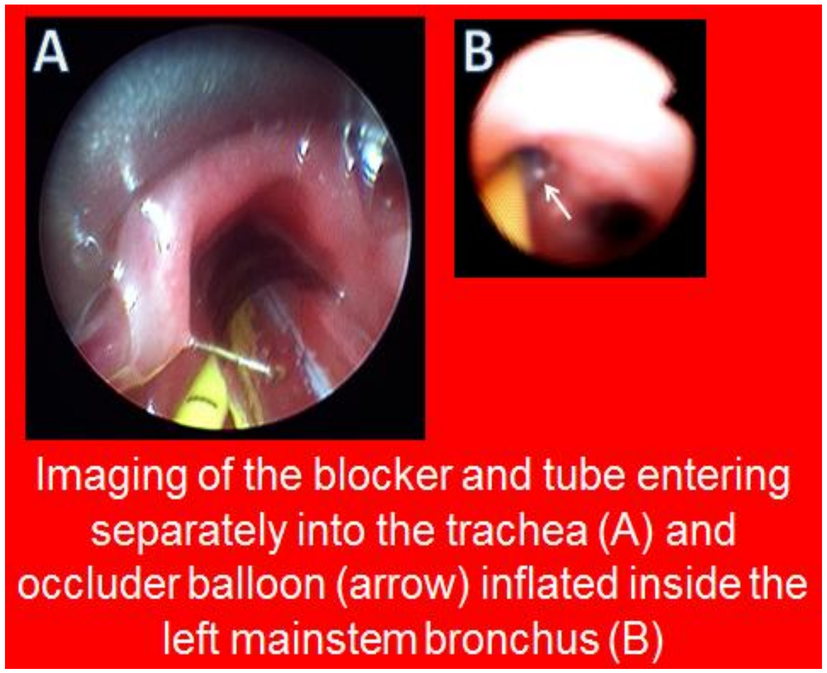

Imaging of the blocker and tube entering separately into the trachea (A) and occluder balloon (arrow) inflated inside the left mainstem bronchus (B)

Left lung isolation was obtained by inserting an Arndt blocker into the left mainstem bronchus, as illustrated in the photographs above, using the technique described by reference number 4.

Table: Patient characteristics, isolation technique, and blood gases measured during one lung ventilation of the dependent lung.

Age	Weight (kg)	Isolation	pH	PO_2	FiO_2	PO_2/FiO_2	PCO_2	$ETCO_2$	PCO_2-$ETCO_2$
2DO	3.0	Blocker	7.38	91	0.6	147	40	29	11
3DO	2.5	Blocker	7.21	78	1.0	78	58	23	35
4DO	2.8	Blocker	7.38	303	1.0	303	36	21	15
4WO	2.8	Blocker	7.27	96	1.0	96	49	22	27
6WO	4.1	Blocker	7.30	232	1.0	232	52	26	26
8WO	4.3	Blocker	7.30	91	0.6	163	51	29	22
4MO	7.9	Mainstem	7.28	83	0.5	166	48	26	22
4MO	7.4	Blocker	7.17	209	1.0	209	69	47	22
5MO	7.4	Blocker	7.29	83	0.6	136	50	12	38
15MO	9.8	Mainstem	7.28	194	1.0	194	47	26	21
20MO	9.9	Blocker	7.22	103	1.0	103	53	39	14
		Average	**7.20**	**140**		**166**	**50**	**27**	**23**

RESULTS

11 infants undergoing thoracotomy were included in this series. The procedures included 7 lung resections and 4 aortic coarctations. Initial placement took **5- 18 minutes**. Lung isolation was rated good to excellent in all cases, but required additional blocker manipulation in 5. No patients developed post-op croup. All patients were successfully **extubated within 12 hours** of surgery and had an uneventful recovery.

DISCUSSION

The right bronchus is usually avoided for isolation because the right upper lobe bronchus is proximal and variable in location making it tedious to position the ET tube or blocker. We found that the most efficient blocker-placement method was to place the blocker distally into the left bronchus with the patient supine and then, with bronchoscopy guidance, adjusting the position of the blocker **after turning the child to the lateral position**. Oxygenation was adequate, but conventional ventilator settings frequently resulted in hypercarbia that was not always detectable with capnography. Therefore, arterial line placement for blood gas analysis is recommended. Gas exchange may not always be adequate and blockers can become displaced so careful monitoring is essential. Single-lung ventilation can be safely administered to infants if Arndt blockers, pediatric bronchoscopes, and expertise with their use are available.

REFERENCES

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