

Cerebral Autoregulation During Antegrade Cerebral Perfusion in Neonatal Aortic Arch Reconstruction

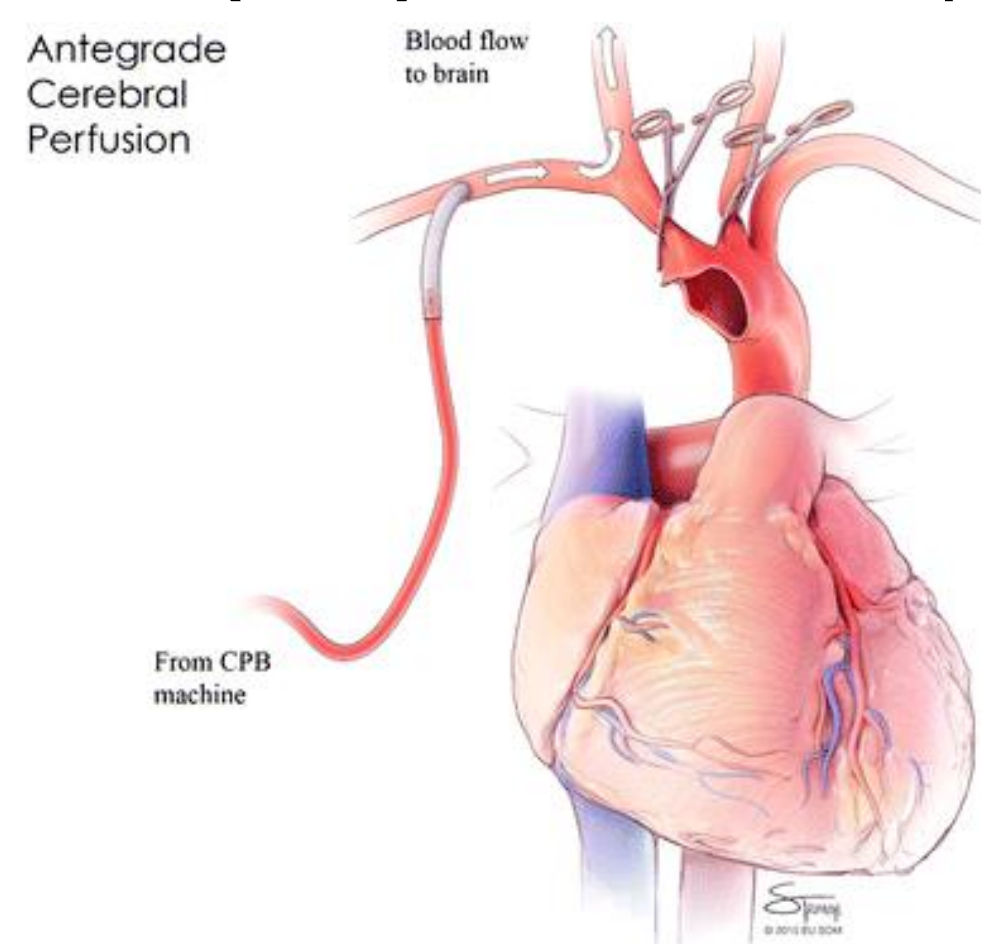
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Background

- Aortic arch reconstruction requires cessation of circulation
- Human brain exhibits the ability to autoregulate within certain pressure ranges
- Antegrade cerebral perfusion (ACP) is a technique used for neuroprotection
- Unknown whether autoregulation remains intact during ACP
- This study aims to determine whether neonates exhibit cerebral autoregulation during ACP
- Our hypothesis is that vasoreactivity is functional during ACP



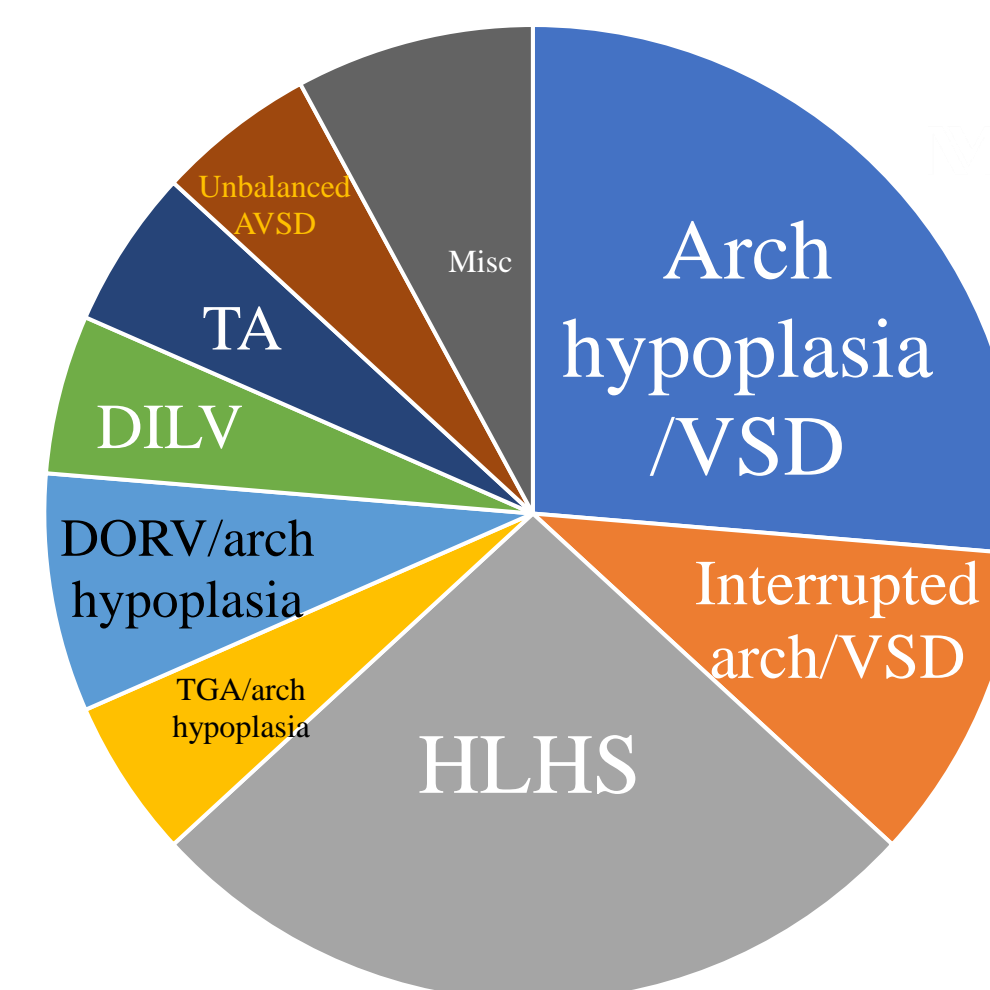
Methods

- Neonates who underwent cardiopulmonary bypass (CPB) with ACP between Aug. 2021 to Jan. 2024
- Cerebral autoregulation curves were constructed to determine the lower limits of autoregulation (LLA)
- Primary outcome measure is Hemoglobin Volume Index (HVx)
 - Pearson correlation coefficient between THb and mean arterial blood pressure (MAP)
 - HVx of 0.2 used as cutoff for intact cerebral vasoreactivity based on previous research
- When dysfunctional autoregulation is present, THb and MAP will positively correlate

Results

- 38 Neonates included in the study

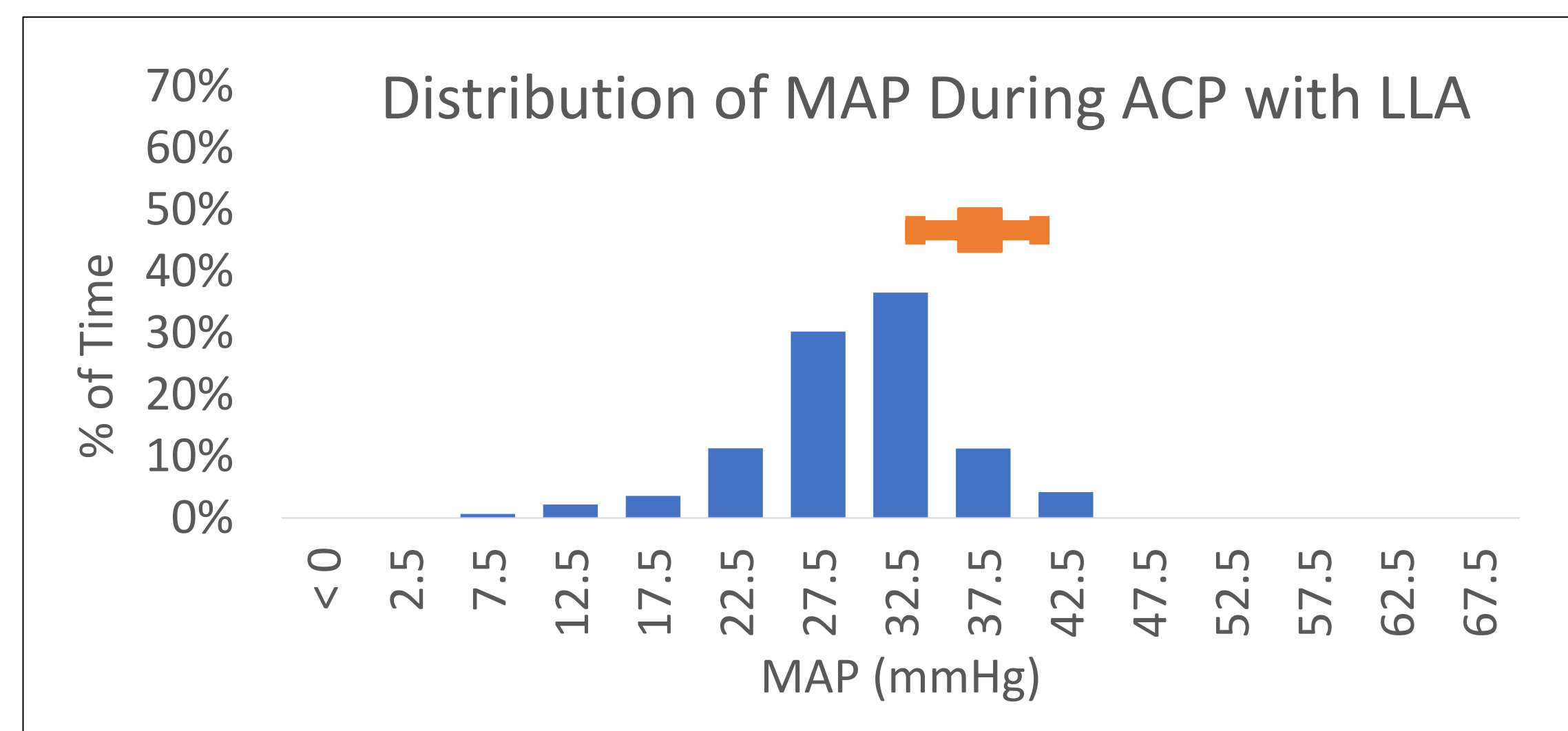
	Median (IQR)
Age (days)	6 (4, 9)
Weight (kg)	3.12 (2.86, 3.4)
Gender n, (% male)	22 (58%)
Gestational age (weeks)	38.4 (37.3, 39)
CPB (min)	163 (143, 177)
ACP (min)	55 (47, 74)
DHCA (min)	3 (2, 8)



- LLA is 38.08 mmHg (34.55, 41.31)

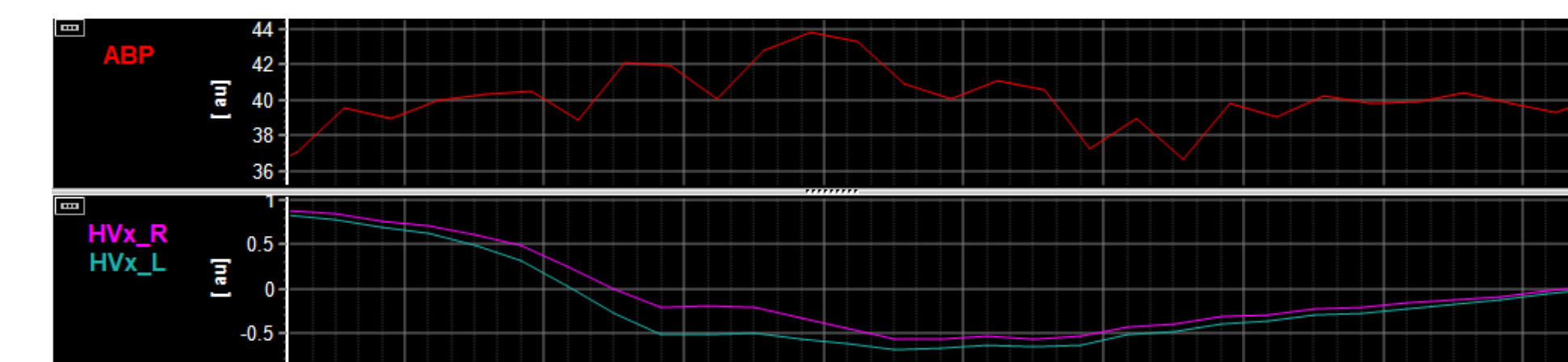
	During CPB	Median (IQR)	During ACP	Median (IQR)	p*
Mean ABP (mmHg)	37.19	37.19 (32.46, 39.53)	30.04	30.04 (27.17, 33.45)	< 0.001
Mean HVxL	0.30	0.30 (0.23, 0.39)	0.35	0.35 (0.23, 0.43)	0.638
Mean HVxR	0.29	0.29 (0.25, 0.35)	0.32	0.32 (0.17, 0.41)	0.429

*Wilcoxon sign test



Discussion

- 5 patients had mean MAPs above LLA during ACP
- When examined individually, 8 patients had intact autoregulation during ACP
 - there may be collateral vessels allowing pop-off of excess blood flow
- 2 patients who had mean MAPs above LLA during ACP also had intact autoregulation



Example of cerebral autoregulation

Conclusions

- Autoregulation is impaired during ACP in neonates
 - unclear if this is due to hypotension or if isolation of the cerebral vascular bed by ACP causes impaired autoregulation
 - Vasoreactivity appears intact in select patients

Limitations and Future Directions

- Small sample size
- Aortic cannula may obstruct right radial arterial line readings in some patients
- Larger study: enroll more patients

References

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