

Fontan Circulation and Neuraxial Anesthesia: A Case Report

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Background

- Fontan circulation involves a single-ventricle heart with direct connection between systemic venous return and pulmonary arteries, bypassing the right ventricle.
- As Fontan survivors increase, encountering them in medical scenarios, including surgeries, becomes more common.
- Neuraxial anesthesia, especially spinal anesthesia, presents challenges in Fontan physiology.
- This case report explores Fontan circulation's physiological implications, neuraxial anesthesia impact, and stresses the need for careful perioperative management.

Case

- 28-year-old male with Fontan palliation underwent left knee arthroscopy and ACL repair.
- Past medical history: history of double inlet, double outlet left ventricle; hypoplastic right ventricle; transposed great arteries repaired with Fontan procedure at age 4; no complications since childhood.
- Preoperative regional anesthesia: femoral nerve block and catheter with 0.5% ropivacaine and dexamethasone.
- Intraoperative stability with spinal block, midazolam, IV Clindamycin, and dexmedetomidine infusion.
- Hemodynamic stability maintained without pressors; procedure lasted 90 minutes.
- Postoperative course: uneventful, femoral nerve block catheter infusion; discharged on post-op day 1.

Relevant Imaging and Tests

- ECHO: Moderate dilatation of the neoartiac root with trivial AI (Pulmonary arteries not well seen)
- EKG (Sinus Rhythm, LVH)
- Stress Tests- Normal cardiovascular performance. 1 ventricular couplet close to peak exercise, Desaturated at baseline and dips to 77% with exercise
- Chest MRI (No evidence pf branch pulmonary artery stenosis) - 1999

Discussion

- Physiology of Fontan Circulation:
 - Fontan procedure segregates systemic and pulmonary circulations, improving oxygenation in single-ventricle physiology.
 - Indications for Fontan procedure include tricuspid atresia, hypoplastic left heart syndrome, double inlet left ventricle, and pulmonary atresia with intact ventricular septum.
- Neuraxial Anesthesia and Fontan Physiology:
 - Fontan patients sensitive to factors affecting venous return, pulmonary vascular resistance, and atrial compliance.
 - Decision-making for anesthesia in Fontan patients multifactorial, emphasizing hemodynamic stability.
 - Spinal anesthesia's potential impact on venous return considered, balancing risks and benefits.
- Fluid Management:
 - Balancing volume overload risk and adequate preload crucial in Fontan patients.
 - Patient assessed and received 1.8L of crystalloid over the 2-hour procedure.
- Postoperative Pain Control:
 - Spinal anesthesia and femoral nerve block utilized for reduced opioid requirements, early ambulation potential, stable hemodynamics, and lower complication incidence.

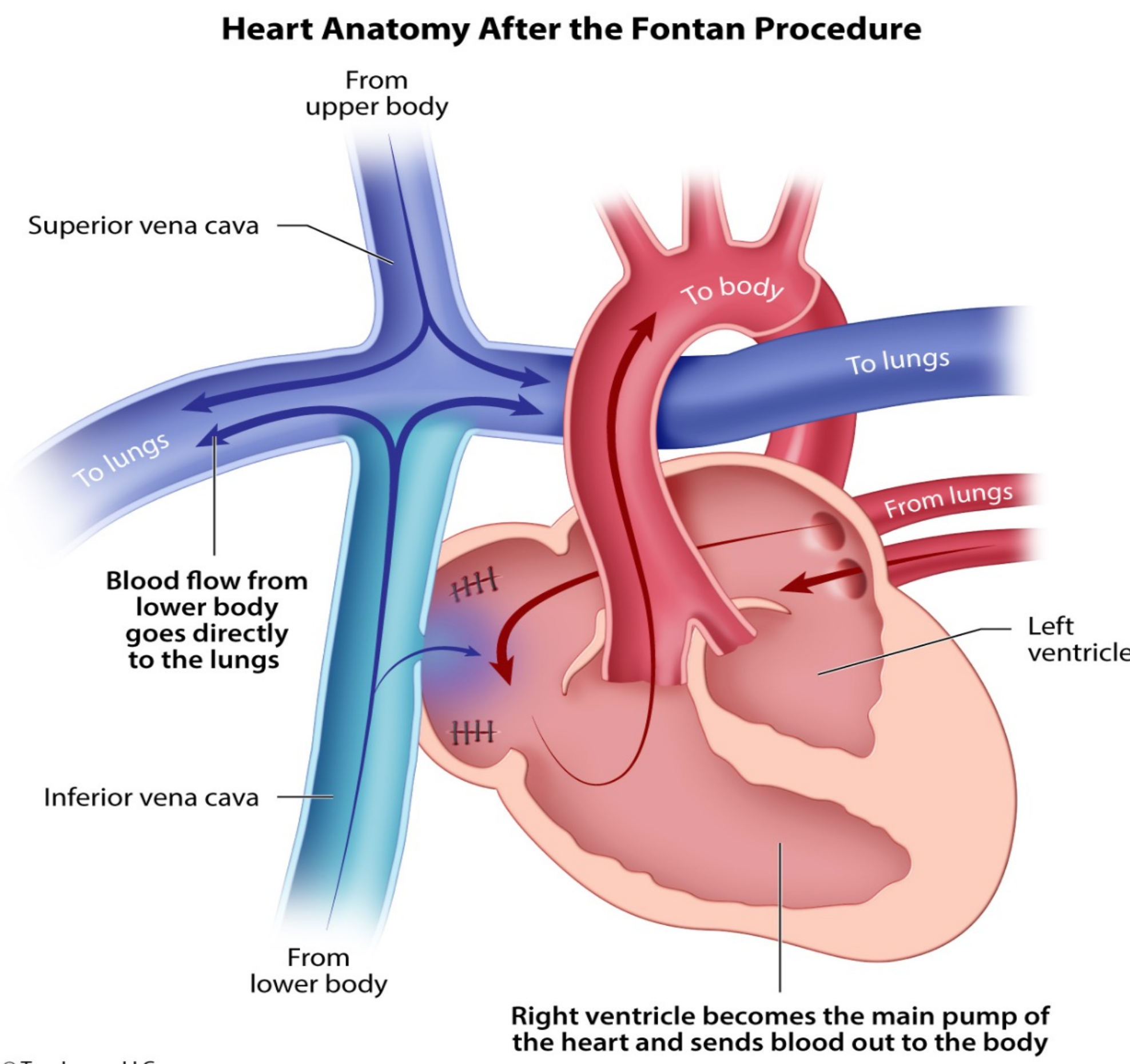


Figure 1: Fontan Physiology
ABA Anesthesiology Content Outline, 2016. "Fontan Single Ventricle Phys"
Kaplan JA, et al. *Kaplan's Cardiac Anesthesia*. Ch. 22: Congenital Heart Disease in Adults. 7th edition.

Conclusion

- Fontan patients undergoing neuraxial anesthesia, particularly spinal procedures, require careful consideration of their unique physiology.
- As Fontan survivor population grows, comprehensive understanding of cardiovascular physiology and tailored perioperative management is crucial.

References

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