PEDS5

Single-Center Experience Improving Nutritional Outcomes in Pediatric Paracorporeal Ventricular Assist Device Recipients

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Purpose: To describe and assess a comprehensive nutritional plan for children implanted with paracorporeal ventricular assist devices (VAD), given they are prone to early satiety, anorexia and nausea which potentially compromise their ability to heal and grow, on top of often already compromised nutritional status due to heart failure. Single-Center Experience Improving Nutritional Outcomes in Pediatric Paracorporeal Ventricular Assist Device Recipients

Methods: Single-center retrospective review of consecutive pediatric patients implanted with paracorporeal VAD before (Dec 2010-June 2019) and after implementation (July 2019-Dec 2021) of a comprehensive, VAD-specific nutritional plan. The plan included targeted micronutrient repletion of vitamins A, C and D as well as zinc, registered dietician directed goal calories from fat, protein and carbohydrates, and minimization of nutrition interruption for planned procedures. Multidisciplinary reassessment occurred twice a week.

Results: A total of 25 patients were identified with 8 implanted after implementation of the new nutritional plan (see Table). Pre- and post-groups were similar, but post-intervention group showed better overall survival (53% vs 100% survival). Micronutrient assessment showed abnormalities in 88% of the post-group that all normalized after 1 month, while micronutrient assessment was largely unknown in the pre-group. The post-group had fewer overall infections, fewer confirmed skin infections, and fewer days on steroids (for inflammation).

Summary: The intensity of wound healing needed for pediatric paracorporeal VAD might be compared to similar needs as those with large abdominothoracic burn, and a similar approach to nutrition and wound healing is likely beneficial.

Characteristics of Pediatric Paracorporeal VAD Patients Pre- and Post- Comprehensive Nutritional Intervention

.	Pre (n=17)	Post (n=8)
Berlin EXCOR	11 (64%)	5 (63%)
Centrimag	6 (36%)	3 (37%)
Diagnosis of Cardiomyopathy	7 (41%)	5 (63%)
Median Device Days	39 (IQR 22-96)	55 (IQR 34-81)
Median Age at Implant (months)	14 (IQR 3-24)	3.5 (IQR 2-37)
Median Weight at Implant (kg)	9.2 (IQR 4.8-12.1)	5.9 (IQR 5-15.8)
Survival	9 (53%)	8 (100%)
Any Culture-Positive Infection	8 (47%)	2 (25%)
Culture-Positive Skin Infection	1 (6%)	0 (0%)
Median Steroid Days	5 (IQR 0-7)	3 (IQR 0-3)

PEDS6

Virtual Anatomic Fit Study of PediaFlow Implantable VAD in Infants (4 Kg To 8 Kg)

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Study: Because of the limited anatomic space available for an implantable VAD in infants, anatomic compatibility in infants is a critical design challenge. Unfortunately, there is limited anatomic data available for infants in the first six months of life. Yet the weight of the child nearly doubles during this period (4 kg to 8 kg for the 50 percentile). Therefore the goals of this research was to create a broad 3D anatomic database for the infant, derived from a limited set of serial CT scans of infants (4 kg – 8 kg) and to conduct a virtual fit study of the PediaFlow PF5 pediatric VAD, including inflow and outflow cannula.

Methods: The series of axial images and two orthogonal images of 4 kg and 8 kg infants were imported into commercially available reconstruction software (Mimics) to create a 3-D surface model of the chest cavity. The clipping tool in Mimics was used to perform qualitative validation on two patients to assess the accuracy of the reference models for the database. The tool allowed the superimposition of axial, coronal, and sagittal CT imaging views onto 3D models, as shown in Figure 1. Interpolation of anatomic data from two reference patients resulted in an animation of the growth of the thoracic cavity and internal organs from 4 kg to 8 kg.

Results: Figure 2 displays the virtual fitting of the PediaFlow PF5 in 5 intermediate anatomic models interpolated between 4 kg and 8 kg. Based on this analysis, we can appreciate the lower limit of patients for whom the PediaFlow and cannula can be fully implanted.

Conclusion: Three-dimensional anatomic data for virtual fit studies in infants is limited. This study produced a scalable 3D model, derived from two reference CT scan data of two patients, that can be used for virtual fit studies, and can also be exported for 3D printing and 4D reconstruction.

Figure 1. Qualitative validation was performed on the reconstructed anatomy of a 4-day-old patient infant.

Figure 2. Results of virtual fit studies in 5 different anatomic models