A Donor PaO_2/FiO_2 Less Than 300 Does Not Determine Graft Function or Survival After Lung Transplantation.

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Purpose

A donor arterial PO_2/FiO_2 (P/F ratio) <300 cut-off is so entrenched in lung transplantation (LTx) practice that such a measurement would invariably result in rejection of the donor lungs for transplantation or placement on ex-vivo lung perfusion (EVLP).

Aims

To investigate the veracity of the P/F ratio threshold of 300 for donor lung acceptability.

Methods

In consecutive brain dead (BD) donors arterial blood gases were drawn in the ICU and from each of the 4 donor pulmonary veins in the operating room (OR) at procurement (performed by The Alfred team). No donor lungs were rejected for transplantation based on the last ICU or OR P/F ratios and EVLP was not used. Recipients were followed up 6 and 12 months post LTx.

Primary outcome: Mortality
Secondary outcomes: Primary graft dysfunction (PGD) score and duration of ventilation.

Results

A total of 99 BD LTx donors (mean age 42±16 years) were included - 56% were male, 52% had a smoking history and the median ventilation duration was 64hr (IQR 38-90). There were 102 lung Tx recipients (mean age 56±13 years).
If a P/F ratio threshold of <300 was used, donor lungs may be rejected by some programs at two points (Figure 1, shaded areas) with 12% rejected in ICU [quadrants 3 (Q3) and Q4] and 24% rejected in the OR at procurement (Q1).
An arterial P/F ratio of <300 was largely driven by a low P/F ratio in the lower lobes (Figure 2), likely reflecting atelectasis.

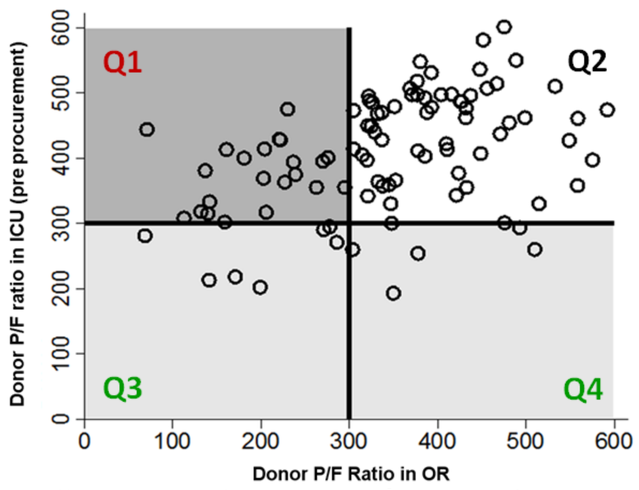

Figure 1: Lungs potentially rejected based on P/F ratio of <300mmHg in ICU (Q3 & Q4) and OR (Q1).

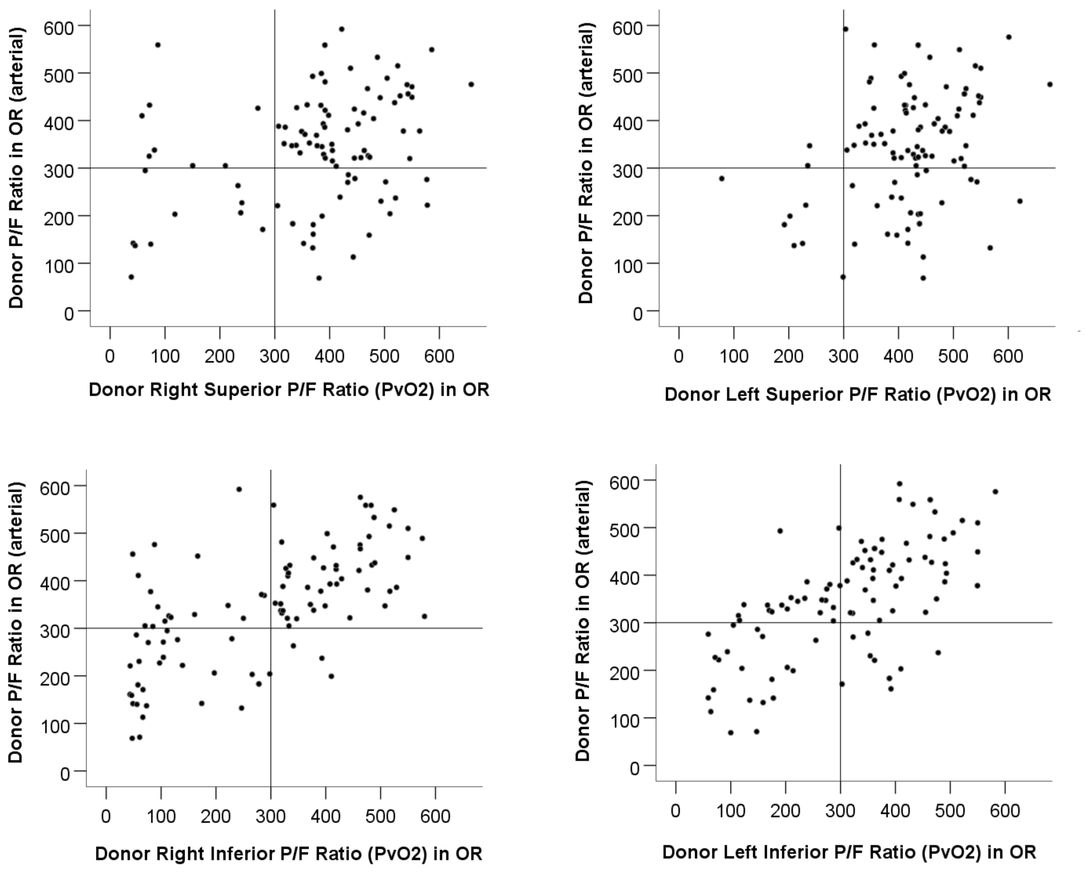

Figure 2: Relationship between donor arterial and pulmonary vein P/F ratios in each lobe in the operating room.

There were no differences between recipients receiving donor lungs where the ICU P/F ratio was <300 compared to ≥300 in time to extubation [median, 35 (IQR 21-45) hr vs 24 (IQR 18-46) hr, p=0.20] (Figure 3) or PGD grade (Figure 4). Six patients died within the first 12 months following transplantation, one from the <300 P/F ratio subgroup and a further five from the ≥300 P/F ratio subgroup (Figure 5).

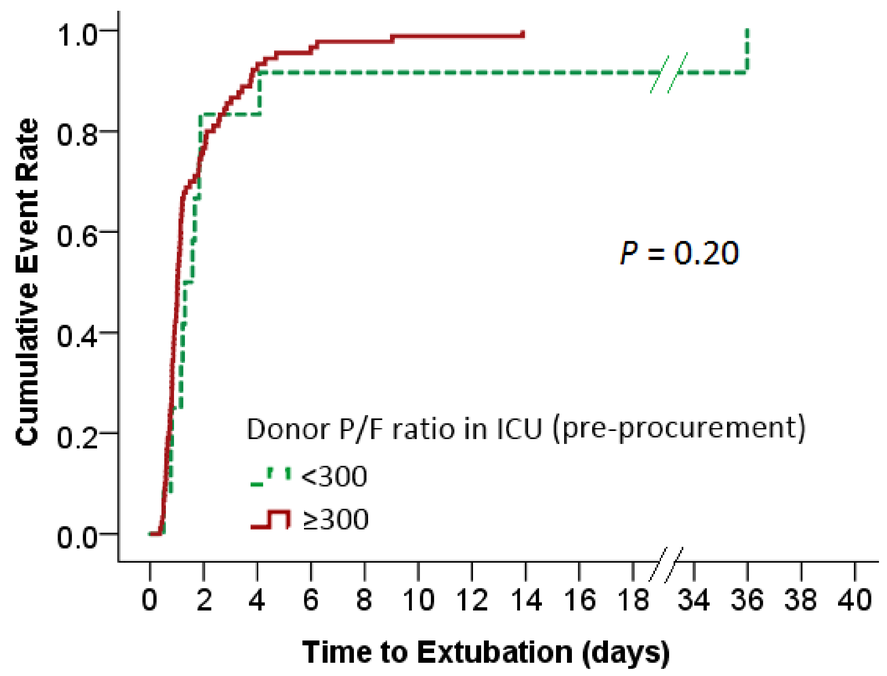

Figure 3: Time to extubation in donor lungs with a P/F ratio of <300mmHg versus ≥300mmHg.

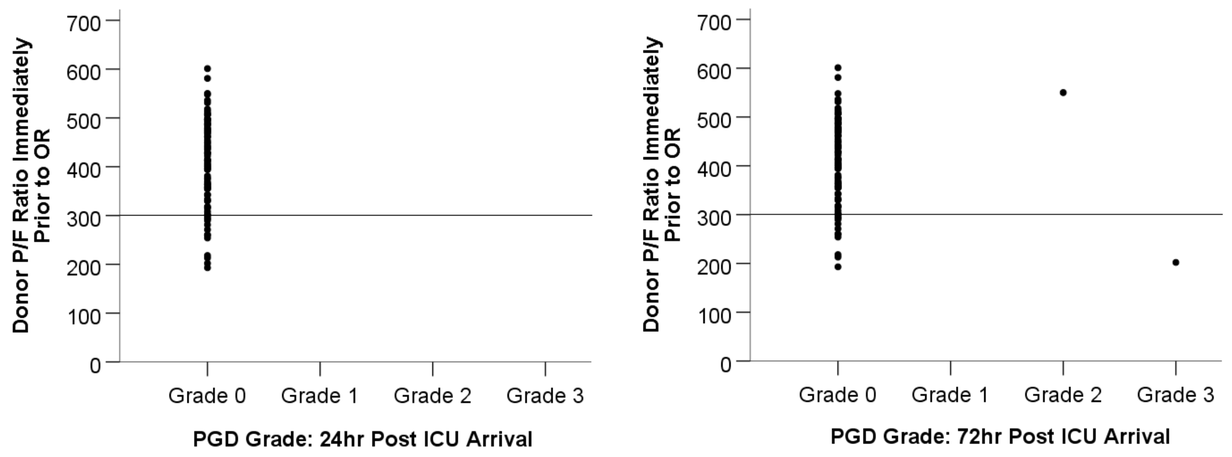

Figure 4: Recipient PGD Grade in ICU according donor to P/F ratio.

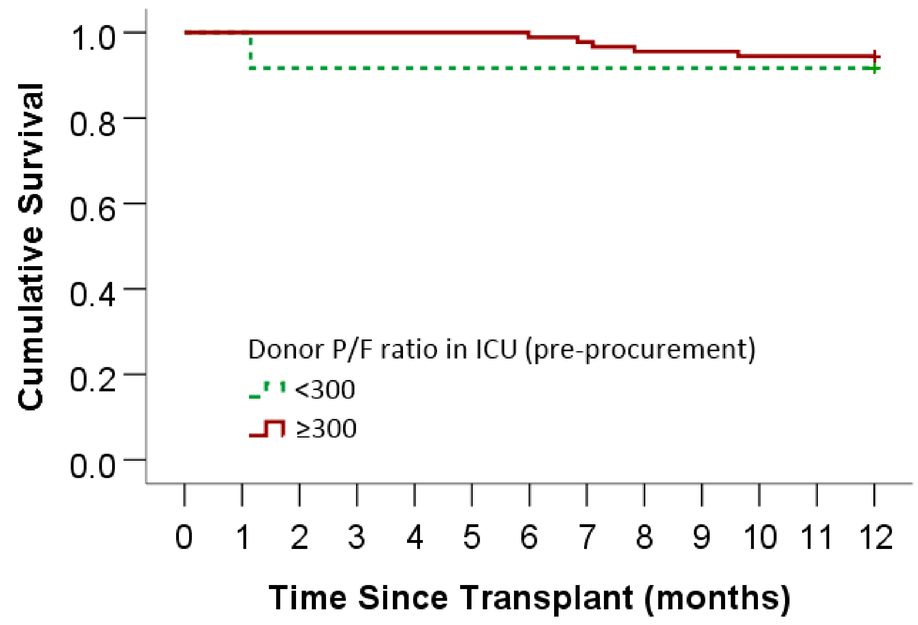

Figure 5: Transplant recipient survival stratified by donor lung P/F ratio of <300mmHg versus ≥300mmHg.

Conclusion

- From this study,
  - If the traditionally accepted donor P/F threshold of 300 was adhered to for donor lung acceptability, 36% would have been rejected.
  - A donor arterial P/F ratio less than 300 is largely driven by the low P/F ratio in the lower lobes, likely due to atelectasis.
  - The donor P/F ratio threshold of 300 used for acceptability of donor lungs is excessively conservative and results in wastage of donor lungs and the application of unnecessary EVLP.

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