Novel Markers for Monitoring Kidney Transplants

Translational Science Benefits Model

IMPACT PROFILE

The Challenge

Although physicians have been successfully performing kidney transplants for nearly seven decades, almost all kidney recipients will eventually experience a degree of rejection and subsequent failure of their transplant. A fundamental challenge in this field is achieving balance between suppressing the immune system to avoid rejection while mitigating the risk of infection and cancer that are adverse effects of common immunosuppressant medications.

The Approach

We are attempting to develop methods by which markers personalized to a kidney transplant recipient and donor can be used to monitor a recipient's risk of rejection and guide immunosuppressant therapy. Initially, we are validating computational algorithms that predict cellular immunity between donors and recipients by measuring cellular (T cell) reactivity in the lab. Then, we will identify blood or urine markers specific to a kidney donor that can be monitored in a recipient over time. Our ultimate goal is to create a tool that can personalize treatment, ensuring the right balance of medication to prevent rejection while minimizing side effects.

The Impact

We have demonstrated that computer-based methods can predict immune responses between kidney transplant recipients and donors, which affect the success of the transplant. The main goal of this project is to develop a tool that can act as a personalized marker to help adjust medication levels, ensuring the right amount of immunosuppression to prevent rejection while minimizing side effects for organ transplant patients. This tool could help improve the recipient's medication plan and increase the lifespan of both the transplant and the patient.

RESEARCH HIGHLIGHTS

- Created a database of over 400 kidney transplant recipient/donor pairs at University of California San Diego to study how different methods of predicting immune reactions affect transplant outcomes.

- Developed risk scores for various "molecular mismatch" methods and are currently testing these within our own group while looking for others to test them as well.

- Our recent work shows that using more detailed tests of the donor's and recipient's immune systems gives more accurate predictions with our computer algorithms.

- This research is helping to improve guidelines and standards for transplant and immunogenetics labs.

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Key Benefits

CLINICAL

Biomedical Technology- *Demonstrated*
We have shown that certain computer-based methods (like "molecular mismatch" algorithms) can predict kidney transplant outcomes, such as rejection, and we are currently testing the underling mechanisms of these methods in the lab.

CLINICAL

Diagnostic Procedures- *Potential*
These results could lead to a future clinical trials using personalized biomarkers.

CLINICAL

Guidelines- *Potential*
These results can lead to more accurate practices of predicting kidney transplant outcomes and can potentially inform future clinical practice guidelines.

COMMUNITY

Life Expectancy & Quality of Life- *Potential*
A personalized biomarker would enable precise dosing of immunosuppressant medications, helping to prevent rejection while minimizing the risks of cancer or infection.

COMMUNITY

Healthcare Delivery- *Potential*
Higher or lower predicted risks of adverse outcomes can help determine if kidney transplant recipients need additional tests or medication adjustments.

POLICY

Policies- *Potential*
By showing that 'high resolution' HLA typing can impact accuracy of kidney transplant outcome prediction, this may inform laboratory policies on a local or national level.

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