Live Imaging of Corneal Lymphatic Vessels

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Technology description

Lymphatic research is an explosive field of new discovery in recent years. Lymphatic dysfunction has been found in a wide array of disorders which include but are not limited to cancers and tumors, inflammation, infection, autoimmune diseases, dry eye, chemical burn, and tissue or organ transplant rejection, etc. The cornea provides an optimal site for lymphatic research due to its accessible location, transparent nature, and lymphatic-free but inducible features. Because there are no pre-existing vessels to consider in this unique tissue, it is exceptionally straightforward and accurate to assess lymphatic events (from formation to maturation and regression) in the cornea. Since lymphatic vessels are not easily visible as blood vessels, previous studies using the cornea have relied on traditional immunohistochemistry assays with dead tissues. Currently, there are no means of direct and harmless visualization of lymphatic vessels within live cornea.

Investigators at University of California at Berkeley have addressed this challenge by developing the first live imaging of corneal lymphatic vessels. Lymphatic specific dye is injected into the subconjunctival space to visualize lymphatic vessels at various stages in the cornea under a fluorescence stereo, confocal, or two-photon microscope. Moreover, lymphatic vessels can be visualized in different colors to produce two, three, and four-dimensional images or live videos at a molecular level. The investigators have demonstrated a proof of principle in live mouse cornea. The technique allows time course tracking of dynamic lymphatic processes within the same tissue or subject over a short or long period of time, and can be ideally used to assess the progression of disease development and the effect of drug treatment. Live imaging of corneal lymphatic vessels allows visualization of lymphatic vessels in their natural morphology, state, and interactions with the local environment. This noninvasive method of live imaging of corneal lymphatic vessels is readily applicable to patient examination and the lymphatic dye of dextran is bio-degradable and harmless to human health.

Additional Information

Related Materials

Live Imaging of Newly Formed Lymphatic Vessels in the Cornea

Additional Technologies by these Inventors

Modulation of Ang-2 to Treat Pathologic Lymphangiogenesis

Combined Blockade of VEGFR-3 and VLA-1 to Improve Transplant Survival

Methods and Materials to Treat Lymphangiogenesis

Application area

Research systems and apparatus for use with a broad spectrum of molecular and cellular mechanisms underlying lymphatic processes from formation to maturation and regression in laboratory and in clinics

Research systems and apparatus to assess and diagnose lymphatic vessels of the cornea in diseases, and provide guidelines for therapeutic intervention of lymphatic processes, whether at the early, middle, or late stages, or before and after a pharmaceutical intervention.

Lymphatic specific drug delivery tool

Advantages

Identifies lymphatic vessels in live and intact corneas, which can be induced by a variety of pathological stimulations, such as inflammation, cancers and tumors, infection, trauma, transplantation, or chemical burn

Lymphatic vessels can be labeled in different colors

Provides live molecular level videos and detailed 2-4 dimensional lymphatic vessels pictures

Over-the-course longitudinal observation of dynamic lymphatic processes (from formation to maturation and regression) in the same tissue and subject

Detects lymphatic interaction with other components in the local environments, such as cells, blood vessels, and nerves

Non-invasive local method; dye is bio-degradable and harmless to human health

Readily applicable to patient setting

Institution

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