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Hyperspectral imaging for assessment of initial graft function in human kidney transplantation

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The aim of our study was to evaluate Hyperspectral Imaging (HSI) as a rapid, non-ionizing technique for the assessment of organ quality and the prediction of delayed graft function (DGF) in kidney transplantation after static cold storage (SCS, n = 20), as well as hypothermic machine perfusion (HMP, n = 18). HSI assessment of the kidney parenchyma was performed during organ preservation and at 10 and 30 min after reperfusion using the TIVITA® Tissue System (Diaspective Vision GmbH, Am Salzhaff, Germany), calculating oxygen saturation (StO₂), near-infrared perfusion index (NIR), tissue haemoglobin index (THI), and tissue water index (TWI). Recipient and donor characteristics were comparable between organ preservation groups. Cold ischemic time was significantly longer in the HMP group (14.1 h [3.6–23.1] vs. 8.7h [2.2–17.0], p= 0.002). The overall presence of DGF was comparable between groups (HMP group n = 10 (55.6%), SCS group n = 10 (50.0%)). Prediction of DGF was possible in SCS and HMP kidneys; StO₂ at 10 (50.00 [17.75–76.25] vs. 63.17[27.00–77.75] %, p= 0.0467) and 30 min (57.63 [18.25–78.25] vs. 65.38 [21.25–83.33]%, p= 0.0323) after reperfusion, as well as NIR at 10 (41.75 [1.0–58.00] vs. 48.63 [12.25–69.50], p= 0.0137) and 30 min (49.63 [8.50–66.75] vs. 55.80 [14.75–73.25], p= 0.0261) after reperfusion were significantly lower in DGF kidneys, independent of the organ preservation method. In conclusion, HSI is a reliable method for intraoperative assessment of renal microperfusion, applicable after organ preservation through SCS and HMP, and predicts the development of DGF.

Recent publications:

1. Wagner T, Radunz S, Becker F, Chalopin C, Kohler H, Gockel I, Jansen-Winkeln B. Hyperspectral imaging detects perfusion and oxygenation differences between stapled and hand-sewn intestinal anastomoses. *Inn Surg Sci* 2022; accepted for Publication May 25, 2022.
2. Wagner T, Katou S, Wahl O, Vogt F, Kneifel F, Morgul H, Vogel T, Houben P, Becker F, Struecker B, Pascher A, Radunz S. Hyperspectral imaging for quantitative assessment of hepatic steatosis in human liver allografts. *Clin Transpl* 2022; May 27: e14736.
3. Romann S, Wagner T, Katou S, Reuter S, Vogel T, Becker F, Morgul H, Houben P, Wahl P, Pascher A, Radunz S. Hyperspectral Imaging for Assessment of Initial Graft Function in Human Kidney Transplantation. *Diagnostics* 2022;12(5):1194.
4. Sucher R, Wagner T, Köhler H, Sucher E, Guice H, Recknagel S, Lederer A, Hau HM, Rademacher S, Schneeberger S, Brandacher G, Gockel I, Seehofer D. Hyperspectral Imaging (HSI) of Human Kidney Allografts. *Ann Surg*. 2020 Nov 13.
5. Hau HM, Jahn N, Brunotte M, Wagner T, Rademacher S, Branzan D, Sucher E, Seehofer D, Sucher R. Pre-operative ankle-brachial index for cardiovascular risk assessment in simultaneous pancreas-kidney transplant recipients: a simple and elegant strategy! *BMC Surg*. 2021 Mar 22;21(1):156.

Biography

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