

Near infrared light usage during partial nephrectomy - Sopio Abazadze - Tbilisi state medical university

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Introduction:

A nephrectomy is the surgical removal of a kidney, performed to treat a number of kidney diseases including kidney cancer. It is also done to remove a normal healthy kidney from a living or deceased donor, which is part of a kidney transplant procedure. Over the past two decades, the incidence of the kidney cancer has increased by 2% worldwide. The number of young people with kidney cancer has unfortunately increased. 90-95% of renal malignancies are so called Renal-cell carcinoma (RCC). There are various indications for this procedure, including renal cell carcinoma, a non-functioning kidney (which may cause high blood pressure) and a congenitally small kidney (in which the kidney is swelling, causing it to press on nerves, which can cause pain in unrelated areas such as the back). Nephrectomy for renal cell carcinoma is rapidly being modified to allow partial removal of the kidney. Nephrectomy is also performed for the purpose of living donor kidney transplantation. A nephroureterectomy is the removal of a kidney and the entire ureter and a small cuff of the bladder for urothelial cancer of the kidney or ureter. Currently, more than 50% of cases of kidney cancer are discovered incidentally in instrumental studies. RCC treatment is surgical removal of the tumor. The surgery is performed with the patient under general anesthesia. A kidney can be removed through an open incision or laparoscopically. For the open procedure, the surgeon makes an incision in the side of the abdomen to reach the kidney. Depending on circumstances, the incision can also be made midline. The ureter and blood vessels are disconnected, and the kidney is then removed. The laparoscopic approach utilizes three or four small (5–10 mm) cuts in the abdominal and flank area. The kidney is completely detached inside the body and then placed in a bag. One of the incisions is then expanded to

remove the kidney for cancer operations. If the kidney is being removed for other causes, it can be morcellated and removed through the small incisions. Recently, this procedure is performed through a single incision in the patient's navel. This advanced technique is called single port laparoscopy. For some illnesses, there are alternatives today that do not require the extraction of a kidney. Such alternatives include renal embolization for those who are poor candidates for surgery, or partial nephrectomy if possible. Occasionally renal cell cancers can involve adjacent organs, including the IVC, the colon, the pancreas or the liver. If the cancer has not spread to distant sites, it may be safely and completely removed surgically via open or laparoscopic techniques. Current guidelines recommend PN as the treatment of choice for the majority of patients diagnosed with a small renal mass. Near-infrared fluorescence (NIRF) imaging with intraoperative administration of indocyanine green (ICG) is a technology with emerging applications in urologic surgery. ICG is a water-soluble dye that fluoresces bright green when viewed under near-infrared light (700-1000 nm). This technology has been applied to robotic partial nephrectomy, first to potentially allow for the differentiation of renal tumor from normal parenchyma. In this application, it has been hypothesized that normal kidney tissue fluoresces green, while the tumor commonly remains hypofluorescent, thereby aiding tumor excision. Secondly, NIRF imaging with ICG has been employed to facilitate selective arterial clamping during robotic partial nephrectomy, allowing for a regional perfusion deficit in the kidney to be readily identified and therefore targeted at a given tumor. Recent studies have shown the associated decrease in global ischemia to minimize resultant loss of renal function at certain time endpoints. This review presents the

most recent studies and evidence on the intraoperative administration of indocyanine green for robotic partial nephrectomy. Partial nephrectomy (PN) is a recommended type of treatment of localised renal tumors. Real-time intraoperative imaging technique, such as fluorescence imaging with indocyanine green (ICG) administration helps to improve intraoperative and postoperative outcomes in patients who underwent PN. Our work presents results of patients who underwent robotic PN with ICG navigation. PN should always be done (if technically possible) in patients with renal cell carcinoma in a solitary kidney, if bilateral tumors are present, in chronic renal insufficiency or for patients with hereditary renal cell carcinoma. However, leaving a positive surgical margin remains one of the risks associated with nephron-sparing surgery, because this can lead to cancer recurrence. It is noteworthy that the recurrence rate of cancer in patients with positive diagnosis in removed specimen was 16%, whereas in the case when diagnosis give of negative answer the recurrence was 3% .Using NIR, we can diagnose exact margins of the cancer and in few minutes achive negative margins and decrease the risk of recurrence. As a result, in the case revealing positive margines the surgeon will be able to remove the additional portion and will achieve negative margins. The method will be extremely fast and accurate, it takes only few minutes and therby much less time in comparison with express histomorphological examination. A different, much fast, safer and cheaper method than existing ones (histomorphology, MRI and structured light microscopy), will be developed.

manual analysis. High correlation was found between QTRODAT and manual analysis. QTRODAT can be applied for improving the efficiency to evaluate the severity of PD and the possible response after treatment intervention by ^{99m}Tc -Trodat-1 SPECT. Therefore, it may assist nuclear medicine physicianto improve the clinical efficiency with confidence.