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VIDEO ARTICLE

Cadaveric Nephrectomy as a Part of Harvesting Surgery

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Abstract

The best treatment option for end-stage renal disease is renal transplantation (RTx), and the organs for transplantation are supplied from living or deceased donors. Cadaveric donors are always more desirable because a single donor can provide more than one organ and also we do not harm a living person by giving anesthesia or removing one part of his/her body with surgery. Every solid organ transplant surgeon must know how to remove the organs from a cadaveric donor. The patient was a 31-year-old female with a history of hypertension and depression. She was admitted to the hospital after falling from the 3rd floor of the building. She was found to have a subarachnoid hemorrhage on computed tomography (CT) and hospitalized in the intensive care unit. In her examination, Glasgow coma score (GCS) was 3. And she was appropriate for harvesting procedure. 103 minutes later, all suitable organs were extracted from the body and transported correctly. The whole grafts were working adequately. So, cadaveric donor nephrectomy is an important part of the harvesting procedure. The essential steps of this procedure are; preoperative evaluation with the kidney donor profile index (KDPI) and history of the patients, intraoperative evaluation with inspection and palpation, removing organs one by one according to their resistance time to ischemia.

Introduction and Objective

Organ transplantation has a crucial role in administering chronic diseases like cirrhosis, chronic renal failure [1-3]. The best treatment option for end-stage renal disease is renal transplantation (RTx), and the organs for transplantation are supplied from living or deceased donors [2,3]. All over the world, living donors are more than cadaveric donors [4]. However, this ratio is higher for cadaveric transplantation in developed countries because kidney transplantation from deceased donors is always more desirable [4-6]. A single donor can provide more than one organ simultaneously, and this can supply enough organs for the increasing number of patients on the transplantation waiting list [5,6]. Besides, we do not harm a healthy person by giving anesthesia or removing one part of his/her body with the risk of surgical complications [4,6].

Every solid organ transplant surgeon must know how to remove the organ from a cadaveric donor due to the importance of organ extraction time [7]. In the multiorgan harvesting procedure, the organs are retrieving from the donor in a particular order [4,8]. Usually, the heart and lungs are retrieved firstly, the liver retrieved after them, and kidneys are the last organs because they are more resistant to ischemia than other organs [4,8]. Organs are perfused with cold solutions to slow down the metabolism and decrease cellular damage during surgery [4,8]. There are various conditions that we can make cadaveric renal transplantation. Brain death donors (BDD) and cardiac death donors (CDD) are organs' sources. BDD has more successful results than CDD because of the shorter time between the cessation of blood circulation and cold perfusion [8]. So, organ ischemia is minimal in this group. After organ removal, viability assessment is essential. Macroscopic and microscopic evaluations can be used for the determination of viability [8]. We are going to present a video-case that was recorded during a multiorgan harvesting surgery.

Methods

The patient was a 31-year-old female with a history of hypertension and depression. She had no

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operation before. She was admitted to the emergency department after falling from the 3rd floor of the building. She was found to have a subarachnoid and subdural hemorrhage on computed tomography (CT) and hospitalized in the neurosurgery intensive care unit. Her respiration arrested four days later, and she was intubated. Five days later after the intubation, in her neurologic examination, Glasgow coma score (GCS) was 3, the pupillary response to the light was absent in both eyes, and pupils were fixed and dilated. On the brain CT angiography, brain death findings were revealed. The cornea reflex, pharyngeal gag reflex, and tracheal cough reflex were also absent, oculocephalic and oculovestibular test results were compatible with the brain death diagnosis. The diagnosis was declared to the patient's relatives, and they signed the informed consent for the organ donations. The transplantation preparations started to be made.

In the cardiology evaluation, the heart was suitable for transplantation. Also, in the abdominal evaluation, the liver and kidneys were acceptable for the transplantation, and there was no abnormality in the tissue or biochemical tests. The infectious disease department also has investigated the patient, and there was no obstacle for the transplantation. Cardiothoracic surgery, gastroenterological surgery, and urology operators were involved in the operation. Surgery was started with the midline incision from the suprasternal notch towards the pubis. The thorax and the abdominal cavity were investigated for possible pathologies. After that, the intestines and colon were dissected, vena cava inferior visualized. Distal abdominal aorta was isolated below the level of superior mesenteric artery (SMA). The SMA was prepared but not ligated, and the inferior mesenteric artery (IMA) was both dissected and ligated.

Arterial structures were dissected bilaterally until the end of the common iliac arteries, and there was no other vascular structure observed that feeding the kidneys. Two different vascular systems were cannulated for the liver and kidneys' cold perfusion after removing the heart. Firstly, the distal abdominal aorta was canulated under the inferior mesenteric artery. After that, the inferior mesenteric vein was isolated and cannulated. The aorta was prepared for the cross-clamping below the diaphragm and above the coeliac truncus.

The heart was the first organ that was retrieved from the donor. The supracoeliac aorta was clamped and ligated. After ligation, cold perfusion of the organs started. University of Wisconsin solution was used for the cold perfusion of the organs. The heart was extracted from the body after the vena cava inferior (VCI) dissection at the supradiaphragmatic level. Ice was applied over the organs to provide cold ischemia. The second retrieved organ was the liver. After the liver, the kidneys were the last organs.

The kidneys were separated from the surrounding tissues by protecting the perirenal adipose tissue with Gerota's fascia. Both the aorta and VCI were cut both at SMA and aortic bifurcation levels. After total separation of the kidneys and vascular structure, the ureters were cut below where they crossed the common iliac arteries. Kidneys were en-bloc removed, put-on the back table. The venous systems were cut, and the VCI patch stayed with the right renal vein. The aorta was dissected from the anterior midline, and the lumen was inspected for the renal artery inlets. There were only two inlets for the renal arteries. Separation of the kidneys from each other was completed by dissection from the posterior midline. At the end of the surgery, the organs were transported with the preservation bags with cold solutions.

Results

Approximately 103 minutes later, all suitable organs were extracted from the body and transported correctly. The whole grafts were working adequately, and kidneys were not affected negatively by this procedure. We have transplanted the kidneys to the 48 and 72-years-old female, end-stage chronic kidney disease patients, who were already on the transplantation waiting list. Their creatinine, urea levels, and glomerular filtration rates (GFR) have become normal within one week after the operation. In the ten-month follow-up, they did not need hemodialysis, and no rejection symptoms occurred during this period.

Conclusions

In conclusion, cadaveric donor nephrectomy is an important part of the harvesting procedure [4]. The essential steps of this procedure are; preoperative evaluation with the kidney donor profile index (KDPI) and medical history of the patients, intraoperative evaluation with inspection and palpation, removing organs one by one according to their resistance time to ischemia and preserving their anatomical integrity, the quality of multidisciplinary work [2,8]. In this Video 1, we presented a harvesting case to show this procedure's steps one by one. We aimed to contribute to the surgeon training, which is the most important part of this procedure.

Informed Consent

Authors have received and archived consent for the video recording and publication in advance of video recording of procedure from relatives of the patients.

Author Contributions

Concept - EO; Design - EO,MEP; Supervision-EO,ST,YK; Resources-EO,ST,YK; Materials - MEP; Data Collection and/or Processing-EO, MEP; Analysis and/or Interpretation-EO, MEP, ST, YK, KC, MC; Literature Search-MEP, KC, MC; Writing Manuscript-EO, MEP, KC, MC; Critical Review-EO, MEP, ST, YK; Other-XX.

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Conflict of Interest

There is no conflict of interest.

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