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CASE REPORT

Liver-Kidney Transplantation in Monoblock: a Technical Solution for Iliac Site with Advanced Atherosclerosis

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ABSTRACT

Objectives: Report the first case of a combined transplant – liver and kidney – in a single block as a surgical alternative in a patient with advanced atherosclerosis and extensive calcification of aortoiliac arterial vessels. **Methods:** Information was obtained through a medical record review, interviews with the patient, image records of the diagnostic procedures, and a literature review. **Conclusion:** The described surgical technique may represent an efficient and safe alternative when arterial or venous anastomosis is impossible due to anatomical challenges due to previous vascular disease.

Descriptors: Combined Liver-Kidney Transplant; Severe Atherosclerosis.

Transplante Fígado-Rim em Monobloco: Solução Técnica para Sítio Ilíaco com Aterosclerose Avançada.

RESUMO

Objetivos: Relatar o primeiro caso de transplante duplo – fígado e rim – em monobloco como alternativa cirúrgica em paciente com aterosclerose avançada e calcificação extensa de vasos arteriais aortoilíacos. **Métodos:** As informações foram obtidas por meio de revisão do prontuário, entrevista com a paciente, registro de imagem dos métodos diagnósticos aos quais a paciente foi submetida e revisão da literatura. **Conclusão:** A técnica descrita pode representar uma alternativa eficiente e segura em circunstâncias nas quais a anastomose vascular, arterial ou venosa é impossibilitada por desafios anatômicos em decorrência de doença vascular prévia.

Descritores: Transplante Duplo Fígado-Rim; Aterosclerose Grave.

INTRODUCTION

The first double transplant combining liver and kidney was performed, and today, it is a procedure used in 1 to 8% of transplant patients. Patients with chronic decompensated liver disease who have renal dysfunction are more likely to die while awaiting liver transplantation. The frequency of combined liver-kidney transplants increased after the introduction, as a criterion for distributing liver grafts, of the MELD (model for end-stage liver disease) score, whose composition includes serum creatinine[1,2]. Liver allocation for a patient on the waiting list for combined liver-kidney transplantation (LKTx) defines the allocation of both organs from the donor to the recipient[1,2].

LKTx is indicated in patients with end-stage renal dysfunction associated with end-stage liver disease, being a superior alternative to isolated liver transplantation in both immediate and long-term results[1].

The alternative of the procedure with a single access route, with both grafts harvested and implanted in a monobloc, has the potential benefit of reducing cold ischemia of the renal graft, being an alternative to consider in comparison with the traditional technique of liver transplantation and kidney in different surgical sites. Recently, the literature reported two cases of monobloc transplantation, and comparative studies between conventional techniques and monobloc transplantation are not available[3], which is why this must still be considered an unconsolidated alternative. In cases of advanced aortoiliac atherosclerosis, a limiting factor for kidney implantation in the iliac vessels, obtaining an unconventional site for the kidney graft is essential. Similarly, in patients with extensive bilateral thrombosis of the iliac veins, kidney transplantation requires an alternative anatomical site for venous anastomosis[4].

Monobloc LKTx is an alternative technique that allows obtaining a renal graft implantation site in an unconventional position.

The present is the first case of monobloc LKTx in the literature in which this procedure was performed as an alternative technique to overcome the poor conditions of the iliac vessels for kidney transplantation.

Objective

To report the first case of a combined liver-kidney monobloc transplant as an alternative in a patient with extensive calcification of the aortoiliac-femoral arterial vessels.

METHODS

Information was collected through medical record analysis, study and recording of imaging exams, interviews with the patient and bibliographic review.

Case Report

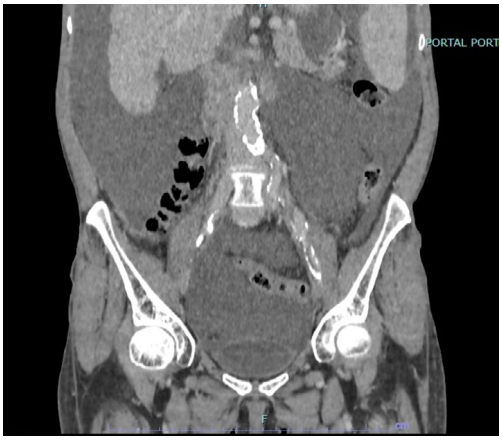
Female patient, 64 years old, with chronic liver disease of presumably ethanolic etiology, abstemious for six years, decompensated by ascites, hypoalbuminemia and renal dysfunction; classification Child B, MELD 21.

During the evaluation for liver transplantation, there was a progressive worsening of renal function, characterizing nephrotic syndrome and stage V chronic kidney disease (CKD) requiring dialysis and with creatinine clearance measured at 5.36 mL/min. She is a smoker with a body mass index (BMI) of 19.9 kg/m^2 and had no signs of peripheral vascular disease or previous history of vascular events.

Computed tomography (CT) of the abdomen showed chronic fibrosing liver disease with atrophy of the hepatic parenchyma, portal hypertension, massive ascites and no evidence of expansive lesions in the liver. It also demonstrated bilateral renal atrophy and aortoiliac-femoral atherosclerosis with extensive and continuous calcification from the origin of the renal arteries to the femoral arteries (Figs. 1, 2 and 3).

Source: Elaborated by the authors.

Figure 1. Descending abdominal aorta showing extensive calcification.



Source: Elaborated by the authors.

Figure 2. Iliac arteries show extensive calcification.

Source: Elaborated by the authors.

Figure 3. Reconstruction of tomography images showing extensive atheromatous involvement in the descending aorta and common, external, and internal iliac arteries.

The transplant evaluation concluded that the patient had chronic fibrosing liver disease in the decompensated cirrhosis stage, CKD stage V, advanced aortic, iliac and femoral atherosclerosis with bilateral, extensive and uninterrupted calcification. Considering these findings, the patient was enrolled on the waiting list for LKTx, leaving the conventional aortoiliac vascular bed unsuitable for arterial reconstruction of the renal graft as a challenge.

Donor and graft harvesting

The donor was male, black, 38 years old, BMI 25.9 kg/m2, user of crack and alcohol, in brain death (BD) secondary to intraparenchymal hemorrhagic stroke that occurred two days before BD, presenting 1.88 mL/kg /h of diuresis and normal blood pressure with the use of noradrenaline at 0.14 mcg/kg/min, veneral disease research laboratory test (VDRL) positive, cytomegalovirus (CMV) negative, creatinine of 2.99 mg/dL, normal liver function and diagnosis of pneumonia undergoing treatment with piperacillin associated with tazobactam.

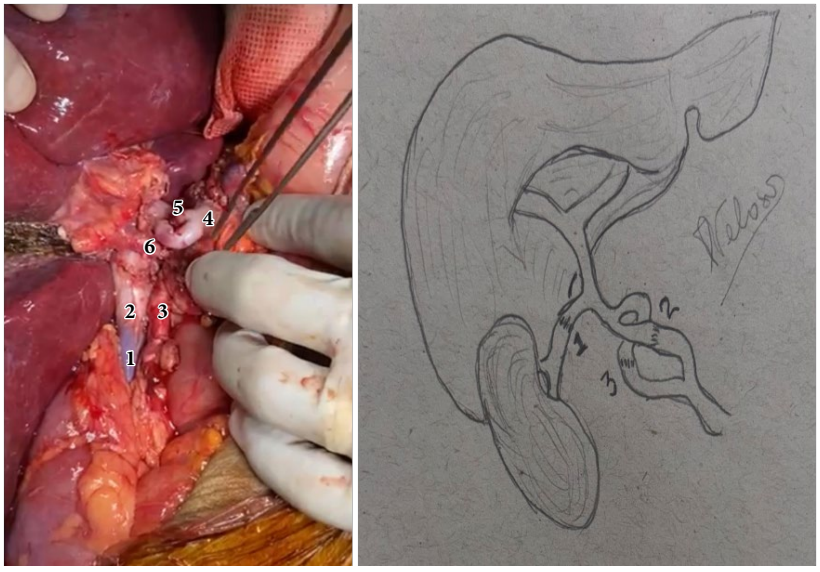
The liver was harvested in a monobloc with the right kidney, joined by the inferior vena cava (IVC). The renal arteries and the celiac trunk were imaged separately. The preservation solution was Institut Georges Lopez-1 (IGL-1) perfused through the aorta and portal vein in situ and through the portal vein ex-situ. The grafts had a normal macroscopic appearance before and after clamping and perfusion. The time between clamping and removal of the monobloc from the cavity was 35 min (service average is 31 min for this phase of isolated liver removal).

Back-table

The IVC was ruptured above the hepatic veins and below the right renal vein, preparing it for the side-to-side anastomosis. The right renal artery was anastomosed to the gastroduodenal artery of the graft.

Transplant

A hepatectomy preserving the retrohepatic IVC was performed, with high ligation of the elements of the hepatic pedicle. Reconstruction of the IVC was performed using a side-to-side piggyback anastomosis. End-to-end portal anastomosis and arterial anastomosis were performed between the celiac trunk of the graft and the recipient's left hepatic artery (which had a larger caliber than the right), followed by simultaneous arterio-portal reperfusion of both grafts, with cold and warm ischemia of, respectively, 311 and 50 min for both grafts (service average for the last 100 cases of liver transplantation is 342 and 42 min). After noticing low arterial flow to the grafts (wide pulses, without thrills and with incomplete filling in systole), it was decided to perform a second arterial anastomosis between the graft's left gastric artery and the recipient's right hepatic artery. This second anastomosis produced a regular arterial pulse in both grafts (Fig. 4).



Source: Elaborated by the authors.

Figure 4. On the left is the final appearance of the liver and kidney grafts. The renal vein of the graft (1) is captured with the IVC (2); Anastomosis of the graft's right renal artery with the graft's gastroduodenal artery (3); Anastomosis of the celiac trunk of the graft with the recipient's left hepatic artery (4); Anastomosis of the graft's left gastric artery with the recipient's right hepatic artery (5); Common bile duct anastomosis (6); On the right is anastomosis between the graft's gastroduodenal artery and the graft's right renal artery (performed during the back-table) (1); Anastomosis between the left hepatitis artery of the recipient and the celiac trunk of the graft (performed for simultaneous reperfusion) (2); Anastomosis between the recipient's right hepatic artery and the graft's left gastric artery (performed to improve the arterial flow of the grafts) (3).

Graft cholecystectomy and biliary anastomosis between the hepatic ducts were performed without the need for the use of biliary drains.

Finally, the right parietocolic leak was mobilized by identifying the middle ureter, followed by its proximal double ligature, section and end-to-end anastomosis with the ureter of the graft over a double J drain.

The patient received antibiotic prophylaxis until the postoperative day (DPO 3) with cefotaxime, ampicillin and benzathine penicillin. 600 mL of packed red blood cells were needed during the operation. At the end of the procedure, the patient was extubated.

Postoperative and follow-up

The grafts showed evidence of immediate function, with urine and bile production shortly after reperfusion. Postoperatively, prothrombin activity reached 90% within six hours, and bilirubin was normal from POD 1. Hemodialysis sessions were necessary until DPO 4, with creatinine reaching 1.5 mg/dL on the day of hospital discharge on DPO 15 (the service average is 11 days of hospital stay for isolated liver transplants). The Doppler performed on POD 4 and 6 showed patent vessels of both grafts with an average resistance index and systolic acceleration time.

Immunosuppression was performed with methylprednisolone in the perioperative period, basiliximab on POD 0 and 3, mycophenolate mofetil from POD 1 and tacrolimus started on POD 5. Prednisone was used in progressively lower doses, reaching 5 mg per day on POD 30. There were no signs of clinical or laboratory findings of rejection of any of the grafts.

The patient had two episodes of urinary infection on POD 30 and 100, with no repercussions on renal function in the first episode when the double J was removed endoscopically. In the second episode, a transient increase in creatinine was associated with a weakly positive quantitative PCR for polymerase chain reaction (CMV) (224 copies, 2.35 log). Both were treated in hospital.

DISCUSSION

LKTx has an established role in the literature. Patients with indications for liver transplantation with end-stage renal disease have primary outcomes, even superior survival if they undergo LKTx compared to liver or kidney transplantation alone.

Classically, LKTx is performed sequentially, with kidney transplantation performed immediately after completion of liver transplantation, using two independent access routes. This implies increased surgical time and longer cold ischemia time of the kidney graft compared to the liver graft.

Monobloc LKTx was performed in the three cases described in the literature to reduce renal graft ischemia time.

In the present case, however, the main objective of choosing the monobloc technique was related to the limited suitability of the aortoiliac arterial bed for renal graft implantation resulting from advanced atherosclerosis with extensive bilateral calcified plaques. An inadequate aortoiliac bed represents a dominant reason for kidney transplantation outside the iliac fossa. We did not find in the literature another case of combined monobloc transplantation as an alternative for cases of inadequate aortoiliac site for renal implantation.

In this case, we did not detect increased risks for the liver graft's accommodation and vascularization or the kidney graft's venous drainage. The uretero-ureteral anastomosis represents a valid alternative to the uretero-vesical anastomosis.

Although the celiac trunk branches can be affected by atherosclerosis, they are often less altered than the iliac and femoral vessels. Therefore, they can represent a consistent alternative in cases of advanced infrarenal atherosclerosis.

In this case, the arterial reconstruction of both grafts from the recipient's celiac trunk required two anastomoses to include flow from both recipient's hepatic arteries. The decision to perform a second anastomosis was based on a preoperative assessment, considering the quality of the systolic filling of the graft vessels. With this complex arterial reconstruction, arterial flow was deemed adequate for the perioperative period and showed normal Doppler flowmetric behavior in the postoperative period.

The function of the grafts and the postoperative course were normal, with no detected deviations potentially attributable to the technique.

Final considerations

The following is the first case of LKTx in which the monobloc technique was chosen to offer a suitable arterial bed for renal graft reconstruction in the presence of advanced aortoiliac atherosclerosis.

Monobloc LKTx is technically feasible and promotes a reduction in total surgical time and renal graft cold ischemia time without increasing liver graft ischemia time.

Additionally, monobloc LKTx was effective, in the present case, in providing a regular arterial bed in a patient with advanced aortoiliac atherosclerosis.

The anastomosis in the recipient's two arteries, both celiac trunk branches, produced an adequate arterial flow volume for the two grafts.

These advantages characterize the technique as an excellent alternative, especially for patients who are candidates for LKTx in the presence of limiting atherosclerotic disease for renal graft implantation in the traditional aortoiliac site.

Due to the small number of three cases described in the literature and the lack of evidence of its effects in the medium and long term, more studies are needed to compare the outcomes with the classic technique.

CONFLICT OF INTEREST

Noting to declare.

AUTHOR'S CONTRIBUTION

Substantive scientific and intellectual contributions to the study: Veloso LF; **Conception and design:** Veloso LF, Veloso MD; **Data analysis and interpretation:** Veloso JPD, Angeli BM; **Article writing:** Veloso MD, Veloso JPD, Angeli BM; **Critical revision:** Veloso LF; **Final approval:** Veloso LF, Veloso JPD, Veloso MD, Angeli BM.

DATA AVAILABILITY STATEMENT

All dataset were generated or analyzed in the current study.

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Not applicable.

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