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CASE REPORT

Treatment of Renal Capsule Lesion in a Transplanted Kidney: A Case Report and Literature Review

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ABSTRACT

Expanded donor criteria have been established to reduce organ wastage, as various factors can lead the disposal of kidneys, such as anatomical abnormalities, traumatic injuries, and iatrogenic injuries during organ retrieval surgery. We report a case of kidney transplantation in which a capsular lesion was identified and repaired during organ preparation (back table) and review of the literature regarding transplant kidney injuries. A diabetic and hypertensive 52-year-old patient with chronic kidney disease undergoing dialysis therapy for 2 years was admitted for a deceased donor kidney transplant. The donor was a 35-year-old man with brain death secondary to traumatic brain injury in a car accident. During the kidney preparation on the back table, a capsular lesion was visualized on the upper pole of the right kidney. Continuous suture of the renal capsule was performed using a 3-0 CatGut suture to correct the defect and reconstruct the renal surface. After renal reperfusion, no active bleeding was observed from the sutured area. The patient had a good postoperative course with no complications. The main complications associated with capsular lesions and complete capsular denudation are bleeding and hematoma formation, as well as urinary and lymphatic extravasation through the exposed renal parenchyma. Treatment may involve direct cauterization using electrocautery or argon plasma, or the use of hemostatic agents. Successful repair of capsular lesions not only prevents complications such as bleeding during reperfusion and urinary fistulae but also plays a crucial role in expanding the pool of organs available for transplantation.

Descriptors: Kidney Transplantation; Chronic Kidney Disease; Multiple Organ Retrieval Surgery; Degloving Injury.

O Tratamento de Lesão de Cápsula Renal no Transplante Renal: Um Relato de Caso e Revisão de Literatura

RESUMO

O critério expandido para doadores foi estabelecido para reduzir o descarte de órgãos. Apesar disso, vários fatores podem levar à não utilização de rins inicialmente viáveis, como anormalidades anatômicas, lesões traumáticas e lesões iatrogênicas durante a cirurgia de captação de órgãos. Relatamos um caso de transplante renal em que foi identificada e reparada lesão capsular durante o preparo do órgão, bem como realizamos revisão da literatura sobre lesões renais em transplantes. Um paciente de 52 anos, diabético, hipertenso, com doença renal crônica, em tratamento dialítico há 2 anos, foi internado para transplante renal de doador falecido. O doador era um homem de 35 anos com morte encefálica secundária a traumatismo cranioencefálico em acidente de carro. Durante o preparo do órgão, foi identificada uma lesão capsular no polo superior do rim direito. Sutura contínua da cápsula renal foi realizada com fio CatGut 3-0 para corrigir o defeito e reconstruir a superfície renal. Após reperfusão renal, não foi observado sangramento ativo na área suturada. O paciente teve boa evolução pós-operatória, sem complicações. As principais complicações associadas às lesões capsulares e ao desnudamento capsular completo são o sangramento e a formação de hematomas, bem como o extravasamento urinário e linfático através do parênquima renal exposto. O tratamento pode envolver cauterização direta com eletrocautério ou plasma de argônio, ou uso de agentes hemostáticos. O reparo bem-sucedido de lesões capsulares previne complicações como sangramento durante a reperfusão e fístulas urinárias, e consiste em estratégia crucial para estimular o uso de todo o contingente de órgãos disponível, abrangendo maior número de receptores.

Descritores: Transplante Renal; Doença Renal Crônica; Cirurgia de Captação de Órgãos; Lesão por Desenluvamento.

INTRODUCTION

The median waiting time (MWT) for a deceased-donor kidney transplant is crucial for patients and healthcare professionals. Utilizing Organ Procurement and Transplantation Network (OPTN) data from January 2003 to March 2022, a reduction in MWT from 5.19 years in 2015-2018 to 4.05 years in April 2021-March 2022 was observed.[1] Despite the decrease in MWT, the list is growing. To expand the availability of deceased donor organs, expanded donor criteria have been established to reduce organ wastage and increase the supply of viable kidneys for transplantation. Various factors can lead to the non-utilization of kidneys from deceased donors intended for transplantation, including anatomical abnormalities, traumatic injuries, and iatrogenic injuries during organ retrieval surgery. Therefore, urologists must exercise caution in organ preparation to prevent iatrogenic injuries, repair existing lesions, and avoid organ discarding. Here, we report a case of kidney transplantation in which a capsular lesion was identified and repaired during organ preparation (back table), enabling successful transplantation without complications.

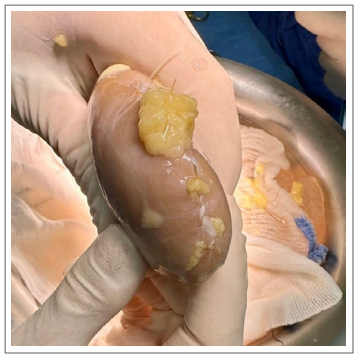
Case report

A 52-year-old patient was admitted for a deceased donor kidney transplant. Chronic kidney disease secondary to diabetes mellitus and hypertension was treated with dialysis therapy for 2 years. A 35-year-old deceased organ donor with brain death secondary to severe traumatic brain injury in a car accident was registered by the local Organ Procurement Organization (OPO). After family consent was obtained, the organ was offered for transplantation. During multiple organ retrieval surgery, the OPO informed the recipient's kidney transplant team about the presence of a capsular lesion in the kidney. The organs were evaluated preoperatively by a surgical team.

During organ preparation on the back table, a capsular lesion was visualized on the convex surface of the upper pole of the right kidney, resulting in a 3 cm discontinuity in the renal capsule (Fig. 1). There were no signs of parenchymal injury, and no subcapsular hematomas were observed. Continuous suture of the renal capsule was performed using a 3-0 CatGut suture to correct the capsular defect and reconstruct the renal surface (Fig. 2). The suture was meticulously performed to prevent bleeding from the renal surface during organ reperfusion. After renal reperfusion, no active bleeding from the sutured area was observed, and there was no development of a subcapsular hematoma (Fig. 3).

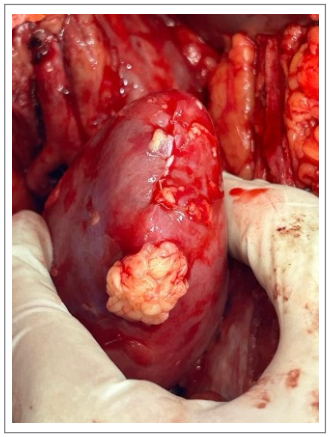
Source: Elaborated by the authors.

Figure 1. Discontinuity in the renal capsule.



Source: Elaborated by the authors.

Figure 2. Capsular defect correction using 3-0 CatGut suture.



Source: Elaborated by the authors.

Figure 3. Transplanted kidney after reperfusion.

The patient had a good postoperative course, with adequate urinary output through a Foley catheter for 5 days and no significant drop in hemoglobin levels. Ultrasound follow-up on the 1st and 3rd postoperative days showed no evidence of collection or subcapsular hematoma. The patient was discharged on the 7th postoperative day, with a serum creatinine of 1.5 mg/dL.

METHODS

A systematic literature search of the PubMed, Embase, Cochrane Library, and SciELO databases was performed to identify studies published from inception until June 13, 2024. The search strategy developed for these databases was to combine the terms "capsular lesion," "capsular tear," "renal transplantation," and "kidney transplantation" using Boolean operators "and" and "or." The reference lists of the selected studies were crosschecked for additional entries. Inclusion criteria considered prospective or retrospective studies written in English regarding surgical management of capsular lesions and tears and their outcomes. We accepted randomized controlled trials, nonrandomized controlled trials, prospective cohort studies, retrospective cohort studies, case-control studies, cross-sectional studies, and case series.

After duplicate removal, 17 records were screened for eligibility by title and abstract analysis by two independent authors (LCS and GCSS). Full texts of four eligible studies were retrieved and reviewed by the authors. Only three articles assessed the scope of this review.[2-4]

DISCUSSION

Capsular lesions in kidneys intended for transplantation can occur during multiple organ retrieval surgery in deceased or living donors, either in conventional or laparoscopic nephrectomy. In living donor nephrectomies, capsular injuries may occur during laparoscopic dissection, hand-assisted dissection of the organ, or even during the removal of the organ from the cavity using an endobag.[2] During multiple-organ retrieval, the kidneys are the last abdominal organs to be removed, and capsular injuries can occur during the release of adhesions and organ dissection, with the most common locations being the lateral convexity and the upper pole, just as in the case report. Regardless of donor modality, such injuries can occur during organ preparation on the back table.

Ochi et al.[5] investigated the anatomical interplay between perirenal adipose tissue and the kidney, elucidating numerous capsular veins coursing along the kidney's surface, extending into the veins within the renal hilar adipose tissue. Additionally, they delineated a subset of communicating veins linking the capsular vessels between the perirenal fat and the renal capsule. Therefore, capsular tears must not be ignored, as they risk major bleeding after reperfusion. Careful organ preparation is essential to prevent iatrogenic injuries to these veins and to identify capsular lesions that should be addressed before implantation.

The main complications associated with capsular lesions and complete capsular denudation are bleeding and hematoma formation, mostly identified intraoperatively, immediately after reperfusion. Intraoperative treatment may involve direct cauterization using electrocautery or argon plasma, or the use of hemostatic agents such as cellulose membranes and fibrin

glue. For cases refractory to these measures, Sezhian et al.3 described the use of a polyglycolic acid mesh sutured to the renal parenchyma to successfully treat extensive capsular lesions.[6,7]

Some capsular lesions may pass unnoticed during surgery, and patients may present with subcapsular hematoma formation and perigraft collections. Other late complications include urinary and lymphatic leakage through the exposed renal parenchyma, delaying hospitalization and increasing the risk of new surgical procedures.

Urinary fistula after kidney transplantation occurs in 1-5% of recipients, with most cases occurring in the distal ureter or ureteroneocystostomy. These can be managed with urinary drainage using a double-J stent or nephrostomy. Rarely, as described in the literature, urine extravasation can occur directly from the region with capsular lesions in the renal parenchyma, which can be identified postoperatively through computed tomography or renal scintigraphy or intraoperatively with the visualization of urine extravasation using dyes such as Indigo Carmine.[4]

The treatment of urinary fistulas caused by capsular lesions is not well established, with only a few cases reported in the literature. These lesions can be treated using cellulose membranes, fibrin glue, or other hemostatic agents following the principles used in partial nephrectomies and renal trauma, as described by Mekeel et al.[2], who achieved success with this technique.

Given the above, the high risk of implanting a kidney with capsular damage is clear. Therefore, surgical management of renal capsular tears during organ preparation is mandatory to reduce allograft discard rates. We present a fast, cheap, and easy-to-perform technique, with none of the aforementioned complications during follow-up. To the best of our knowledge, a similar technique has not been described. The patient was discharged within the expected time frame and with optimal renal function. Effective utilization of the donor pool was achieved, whereas the allograft might have been discarded. Although this case report serves as a valuable contribution to the literature, additional studies with a larger number of patients would be necessary to more robustly assess the efficacy and safety of the technique for repairing capsular lesions.

CONCLUSION

Renal capsular injuries can occur during the retrieval of organs from deceased or living donors and may lead to dangerous complications, but this should not mean immediate allograft discarding. We present a feasible technique with an optimal outcome, which should be adopted by other centers to expand organ availability in the country. Successful repair of capsular lesions plays a crucial role in the effective management of the donor pool and reduced MWT until transplantation.

CONFLICT OF INTEREST

Nothing to declare.

AUTHOR'S CONTRIBUTION

Substantive scientific and intellectual contributions to the study: Fregonesi A, Mazzali M, Miyaoka R. **Conception and design:** Fregonesi A, Miyaoka R. **Data analysis and interpretation:** Oliveira C, Ottaiano AD. **Article writing:** Simões GCS, Souza ABP, Salles LC. **Critical revision:** Fregonesi A. **Final approval:** Simões GCS, Salles LC.

DATA AVAILABILITY STATEMENT

The data are available from the corresponding author upon reasonable request.

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Not applicable.

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