Brazilian Journal of TRANSPLANTATION

https://doi.org/10.53855/bjt.v29i1.755_ENG

ORIGINAL PAPER

Intestinal and Multivisceral Transplantation in Brazil: A Retrospective Cohort and Global Analysis

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Seccion editor: Ilka de Fátima Santana F. Boin

Received: Oct. 28, 2025 | Approved: Nov. 28, 2025

ABSTRACT

Objectives: To evaluate the clinical characteristics and outcomes of patients undergoing multivisceral transplantation (MVT) in Brazil, comparing the results with major international centers. Waiting time, patient and graft survival, and the postoperative rehabilitation process were analyzed. **Methods:** Single-center retrospective cohort study. Medical records of nine patients who underwent MVT at a Brazilian tertiary hospital were analyzed. **Results:** The cohort of nine patients had a median waiting time of 281 days. Patient survival was 66.7% at 1 and 3 years and 53.3% at 5 years post-surgery. No cases of graft rejection were recorded. Postoperative rehabilitation was characterized by a reduction in the duration of total parenteral nutrition, early transition to oral feeding, and multidisciplinary follow-up. **Conclusion:** Although the sample size is small, the survival rate of patients undergoing MVT in Brazil was comparable to that of international centers (70.64% at 1 year; 57.7% at 3 years; 53.23% at 5 years), despite a significantly longer waiting time (median of 281 days). The postoperative rehabilitation protocol, similar to the global standard, proved to be a beneficial factor in recovery.

Descriptors: Organ Transplantation; Intestinal Failure; Survival; Cohort Studies.

Transplante Intestinal e Multivisceral no Brasil: Coorte Retrospectiva e Análise Global

RESUMO

Objetivos: Avaliar as características clínicas e o desfecho de pacientes submetidos ao transplante multivisceral (TMV) no Brasil, comparando os resultados com os principais centros internacionais. Foram analisados o tempo de espera, a sobrevida do paciente e do enxerto, e o processo de reabilitação pós-operatória. **Métodos:** Estudo de coorte retrospectiva unicêntrico. Foram analisados prontuários de nove pacientes que realizaram o TMV em um hospital terciário brasileiro. **Resultados:** A coorte de nove pacientes apresentou mediana de tempo de espera de 281 dias. A sobrevida do paciente foi de 66,7% em 1 e 3 anos e de 53,3% em 5 anos de pós-operatório. Não foram registrados casos de rejeição ao enxerto. A reabilitação pós-operatória foi caracterizada por redução do tempo de nutrição parenteral total, transição precoce para via oral e acompanhamento multiprofissional. **Conclusão:** Embora a amostra seja pequena, a sobrevida dos pacientes submetidos ao TMV no Brasil mostrou-se comparável à dos centros internacionais (70,64% em 1 ano; 57,7% em 3 anos; 53,23% em 5 anos), apesar de um tempo de espera significativamente superior (mediana de 281 dias). O protocolo de reabilitação pós-operatória, similar ao padrão mundial, demonstrou ser um fator benéfico na recuperação.

Descritores: Transplante de Órgão; Insuficiência Intestinal; Sobrevida; Estudos de Coortes.

INTRODUCTION

Multivisceral transplantation (MVT) refers to the en bloc transplantation of abdominal organs dependent on the celiac artery and superior mesenteric artery. Thus, it involves the stomach, pancreas, liver, duodenum, jejunum, and ileum, this being the classic MVT. A variant of the procedure may include or exclude some of these organs[1].

Intestinal and multivisceral transplantation represents the option with the best prognosis for patients with intestinal failure (IF)[2]. IF is characterized by the inability of the intestine to adequately absorb fluids, electrolytes, and nutrients, resulting from a smaller absorption surface area[1,2]. The indications for transplantation are divided between failure of parenteral nutrition (PN) and high risk of death due to the underlying disease[3]. Failure of parenteral nutrition (PN) includes liver failure, thrombosis of major central venous access sites, and frequent infections. High mortality risk, in turn, encompasses benign or low-grade malignant tumors, congenital mucosal diseases, and short bowel syndrome[3].

In recent years, there has been an increase in the survival rate of patients undergoing MVT, resulting from improvements in surgical technique, postoperative clinical management, and the development of new immunosuppressants[4,5]. Despite challenges such as acute and chronic rejection, MVT offers excellent quality of life and the possibility of PN weaning for individuals[4,5].

However, the implementation of this technique in Brazil lags behind the rest of the world, mainly due to the smaller number of specialized and recognized centers for the procedure within the public health system[6]. Given the complexity of the surgery, the existence of a transplant program often depends on a small number of experienced surgeons, resulting in limitations for patients who need the procedure[3]. In 2011, the Albert Einstein Israelite Hospital (*Hospital Israelita Albert Einstein-HIAE*) performed the first MVT in Brazil, but currently only three institutions in the country perform the surgery[7,8].

Thus, although isolated reports exist, the literature lacks detailed data on the dynamics of the waiting list, long-term survival rates, and late complications of MVT in Brazilian cohorts. Comparison of national data with international centers (United States and Europe), despite sociodemographic and resource allocation differences, is necessary to establish a benchmark for technical feasibility and to identify specific bottlenecks in the country's public system.

Given this scenario, the present study aimed to conduct a detailed survey of the clinical history, treatment, and outcome of patients undergoing MVT at a reference center, comparing the Brazilian reality with global results to support proposals for improving the technique in the country.

METHODS

Study design and ethical considerations

This is a retrospective, single-center, analytical, and observational cohort study. The study was conducted in full compliance with good clinical practices and applicable national regulations, including Resolution 466/2012 of the National Health Council. The protocol was approved by the Research Ethics Committee of the Federal University of São Paulo (*Universidade Federal de São Paulo-UNIFESP*) (CAAE: 76462423.9.0000.5505) and of HIAE (CAAE: 76462423.9.3001.0071).

Considering the rigorous anonymization of the data, obtaining informed consent was not considered necessary. Patient data were anonymized by the Intestinal and Multivisceral Transplant sector of HIAE and then made available to researchers through the Research Electronic Data Capture (REDCap) platform, which guarantees security and confidentiality. Patients were identified by numerical codes to prevent re-identification, and no personal information will be revealed in presentations or publications.

Study setting and population

The research was conducted at the School of Medicine of UNIFESP (*Escola Paulista de Medicina*), using data provided by HIAE, where the patients were treated. Nine patients who underwent multivisceral transplantation (MVT) via grafting between January 2012 and December 2021 at the institution, aged 18 to 75 years at the time of transplantation, were included. Eligible patients who died before the procedure were excluded.

The inclusion criteria were defined as: (1) diagnosis of irreversible IF associated with end-stage liver disease [total PN (TPN)]; (2) diffuse thrombosis of the portomesenteric system that would make isolated liver or bowel transplantation unfeasible; or (3) definitive exhaustion of vascular access for PN.

Patients listed who died before the procedure or whose medical records contained insufficient data for the analysis of the proposed variables were excluded from the analysis.

Variables and data collection

This retrospective study did not require any intervention, as all data already existed in the HIAE database. Data collection took place from May 2023 to early 2025, after approval from the UNIFESP Ethics Committee. Access to HIAE data was formalized after approval from the Ethics Committee of that institution. The primary exposure of the study was graft-mediated MVT. The outcomes of interest were waiting time, survival, and the postoperative recovery process. There were no missing data for any of the variables included in the analysis.

Data analysis

Continuous quantitative variables were described using descriptive statistics, with mean and standard deviation presented. Patient survival was analyzed using the non-parametric Kaplan-Meier estimator via RStudio software. The observation period was a maximum of 5 years, with censoring applied to patients whose outcome could not be observed by the end of the study, on 06/06/2025. Using a logarithmic equation, it was possible to estimate the confidence interval (CI) of the survival data obtained.

Study limitations

This study presents limitations inherent to its retrospective, single-center design. A small sample size (n = 9), while representing the entirety of the institution's experience during the analyzed period, limits statistical power and prevents the performance of multivariate regression analyses (such as Cox regression) or stratification by subgroups. Thus, the absence of a control group (patients on the waiting list who did not undergo transplantation) makes it impossible to assess the real relative benefit of transplantation compared to conservative clinical treatment. Additionally, due to the retrospective nature of the old records, it was not possible to apply standardized surgical complication scales (such as Clavien-Dindo) to the entire cohort. The long inclusion interval (2012 to 2021) introduces temporal heterogeneity, since advances in surgical techniques and immunosuppression protocols occurred during this period.

RESULTS

The study included nine participants, which corresponds to the total number of multivisceral transplants performed at HIAE in partnership with the Program to Support the Institutional Development of the Unified Health System (*Programa de Apoio ao Desenvolvimento Institucional do Sistema Único de Saúde PROADI-SUS*) from 2012 to 2021. No eligible patients were excluded, as no deaths occurred before the procedure.

The patients included had a median age of 47 years, with 55.6% being male (five patients). Pre-transplant clinical severity was high, with a median Model for End-Stage Liver Disease (MELD) score of 17 (range: 11-23).

The median body mass index was 24.1 kg/m^2, indicating a predominantly eutrophic nutritional status preoperatively.

All patients in the cohort presented with liver cirrhosis associated with portomesenteric thrombosis as the underlying pathology. Etiologies for this condition included cryptogenic liver cirrhosis, schistosomiasis, Budd-Chiari syndrome, non-alcoholic steatohepatitis, and association with hepatocellular carcinoma.

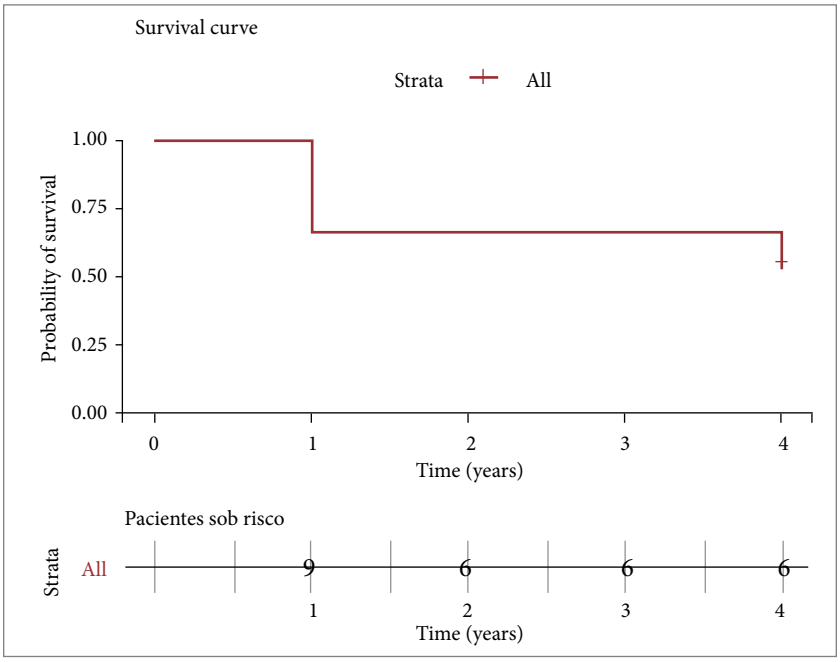
The time patients spent on waiting lists showed considerable variation, from 122 to 1,450 days. Due to the asymmetrical distribution of the data, the median waiting time of 281 days stands out, a value that more accurately reflects the typical patient scenario, minimizing the distortion caused by the extreme values observed in the average (382.5 days).

All patients underwent classic multivisceral transplant (MVT), including stomach, duodenum, pancreas, small intestine, and liver transplants, with no modified or isolated transplants performed in this cohort.

Overall survival was assessed at different time points after the procedure and analyzed using the Kaplan-Meier method (Fig. 1). At one year, the survival rate was 66.7% (six of nine patients; 95% CI 42.0-100), as two patients died during the surgical procedure and one died 8 months and 11 days after transplantation. The six patients who survived the first year were discharged from the hospital and showed good recovery, with complications limited to bacterial infections that were successfully resolved.

The 3-year survival rate remained at 66.7% (six out of nine patients; 95% CI 42.0-100), as there were no new deaths during this period. At 5 years, the survival rate was 53.3% (five out of nine patients; 95% CI 28.2-100.0), after one more death due to an infectious process. The causes of death among the patients who did not survive were septic shock, graft-versus-host disease, and pulmonary edema.

In the postoperative follow-up, all seven patients who survived surgery started parenteral nutrition (PN) immediately and were assisted by a multidisciplinary team. Among these, two developed acute kidney injury, requiring renal replacement therapy.



Source: Elaborated by the authors

Figure 1. Survival curve of patients undergoing MVT in this study. The curve demonstrates the probability of survival (Y-axis) over time in years (X-axis) after the procedure. Vertical marks indicate censored data, which correspond to patients who remained alive until the end of follow-up. The table below the graph shows the number of patients at risk at the beginning of each period.

DISCUSSION

This study reinforces that MVT is an effective technique for increasing the survival of patients with IF associated with complex pathologies, such as liver cirrhosis with extensive portomesenteric thrombosis[9,10]. In our cohort, the surgical technique and postoperative management proved to be safe, with no deaths directly linked to technical complications or graft rejection.

Comparison of clinical results with the literature

The survival rate observed at our center is one of the main findings of this study. The success rate of 66.7% at 1 and 3 years and 53.3% at 5 years is consistent and comparable to the results of major international centers. Data from Indiana University, for example, report a survival rate of 70% at 1 year and 45% in the long term[11], while studies in Italy and the United Kingdom show late survival rates of 42.8% and 50%, respectively[12,13]. This similarity suggests that, once the transplant is performed, the clinical protocols adopted in Brazil reach a global standard of excellence. Additionally, the postoperative recovery process was satisfactory, with all surviving patients progressing adequately from TPN to oral feeding, in line with recommended practices[14]. Therefore, this is a technique that has been showing good results due to advances in immunosuppression protocols and postoperative care in recent decades[15], resulting in a significant increase in the survival rate of patients with multiple organ transplants[16].

Safety and mortality analysis

The observed intraoperative mortality rate of 22.2% (two patients) reflects the technical complexity of the procedure and, primarily, the clinical severity of the recipients at the time of transplantation (high MELD score). This data reinforces the need to optimize the timing of surgical indication.

The challenge of waiting time: a slow and unpredictable system

In contrast to the positive clinical results, analysis of waiting times reveals the system's greatest weakness. The average of 382.5 days in our cohort is already drastically higher than in other countries, such as the United Kingdom (56 days)[17], United States (127 days)[18], Argentina (188 days)[19] and Germany (311.3 days)[20]. However, a deeper analysis of the data reveals an even more critical scenario. The large discrepancy between the average (382.5 days) and the median (281 days) demonstrates that the experience is not only long but also extremely variable. The presence of a patient who waited 1,450 days inflates the average and exposes the unpredictability of the system. This data is alarming, as a waiting time exceeding 90 days is already associated with a cumulative

increase in the risk of death while waiting[18].This variability, more than the average itself, constitutes the strongest evidence of the systemic challenges that need to be addressed in Brazil.

Postoperative recovery and clinical management

In addition to survival rates, the recovery process of surviving patients was satisfactory and demonstrated the effectiveness of multidisciplinary follow-up. All patients had good graft acceptance and progressed adequately from TPN to oral feeding within 1 month, in line with recommended practices aimed at optimizing graft function and organ autonomy[14]. However, the complexity of the procedure is reflected in the observed complications, such as the need for surgical reintervention in two patients and the development of dialysis-dependent acute kidney injury in three. These events, along with resolved bacterial infections, are expected challenges in the postoperative period of MVT and reinforce the need for intensive and specialized care.

International comparison

Survival rates comparable to those in international centers should be interpreted with caution. Unlike the United States and Europe, the Brazilian scenario faces challenges in organ allocation and transportation, which can impact the patient's condition at the time of surgery. Therefore, the similarity in outcomes attests to the technical skill of the surgical team, even in a context of more limited resources.

Study limitations

It is crucial that these results be interpreted within the context of the study's limitations. The main limitation is the small number of participants (n = 9), which reduces the statistical precision of the estimates, as evidenced by the wide confidence intervals in the survival analysis. Additionally, the retrospective study design is subject to bias, although the absence of missing data suggests a high-quality registry. Finally, the origin of the data from a single reference center limits the generalizability of the results, although the observed survival rate is an important marker of the technique's potential in Brazil.

CONCLUSION

This study demonstrates that MVT in Brazil, when performed in a reference center, presents technical feasibility and promising survival results, comparable to data from international literature.

The waiting time in line proved to be long and variable, a factor that is associated with a worse prognosis, although the present study does not have sufficient statistical power to establish a direct causality.

In light of these findings, we suggest that improvements to the national MVT system should focus on centralizing resources, creating specialized surgical training programs, and revising the criteria for prioritizing patients on transplant waiting lists, aiming to mitigate mortality on the waiting list.

CONFLICT OF INTEREST

Nothing to declare.

AUTHOR'S CONTRIBUTION

Substantive scientific and intellectual contributions to the study: Washiya JY, Fiuza OR, David AI, Pereira GS, Gushiken MY, Pecora RAA, Calil IL, Batista RR; **Conception and design:** Washiya JY, David AI, Pecora RAA; **Data analysis and interpretation:** Washiya JY, Fiuza OR, Pereira GS, Gushiken MY; **Article writing:** Washiya JY, Fiuza OR, Pereira GS, Gushiken MY; **Critical revision:** David AI, Pecora RAA, Calil IL, Batista RR; **Final approval:** Washiya JY.

DATA AVAILABILITY STATEMENT

Data will be available upon request.

FUNDING

Conselho Nacional de Desenvolvimento Científico e Tecnológico ROR
Grant no: 139948/2023-8

DECLARATION OF USE OF ARTIFICIAL INTELIGENCE TOOLS

During the preparation of this article, the authors used the Google Gemini artificial intelligence tool exclusively to assist in grammatical review, improvement of cohesion, and structural organization of the text. No scientific content, data, or conclusions were generated by the tool. The authors reviewed and edited the final content and assume full responsibility for the integrity of the publication.

ACKNOWLEDGEMENT

To my family, who have always supported me in every moment. To God, who has always been present and guided me throughout the journey.

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