SERIE DE CASOS

DERIVACIÓN MESOREX EN POBLACIÓN PEDIATRICA CON OBSTRUCCIÓN PORTAL EXTRAHEPATICA.

MESENTERIC TO LEFT PORTAL VEIN BYPASS IN PEDIATRICS WITH EXTRAHEPATIC PORTAL VEIN OBSTRUCTION.

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RESUMEN

Introducción: La obstrucción de la vena porta extrahepática puede presentarse con o sin afectación intrahepática, se caracteriza por hallazgos de trombosis reciente o cavernomatosis portal. **Objetivo:** Mostrar los cambios clínicos, paraclínicos y endoscópicos de la derivación mesoportal en niños con obstrucción de la vena porta extrahepática. **Materiales y métodos**: Reporte de casos retrospectivo, participo cinco pacientes con obstrucción de la vena porta extrahepática, se incluyó pacientes con sangrado recurrente, falla en el tratamiento endoscópico e hiperesplenismo grave, se excluyó niños a los que no se les pudo realizar esta técnica por compromiso parenquimatoso en la biopsia hepática u alteraciones anatómicas vasculares. Se realizó el estudio en un hospital de tercer nivel en México, la información se recolecto de los expedientes clínicos. Se analizó variables demográficas, clínicas, laboratorios, imagen y tratamiento antes y después de la derivación mesoportal. El análisis estadístico se realizó a través de un programa estadístico SPSS Versión 23.0. a los valores con $p < 0,05$ fueron estadísticamente significativos. **Resultados:** Se describe cinco pacientes, el 60,0% represento el sexo femenino y el 40,0 % sexo masculino, edad mediana de 25 meses, el 100,0 % con antecedente de prematurez y cateterismo umbilical en el período neonatal. En

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el 100 % detección de varices esofágicas, varices gástricas y hematemesis previo a la derivación, se identificó leucopenia, linfopenia en el 80,0 %, trombocitopenia e hiperesplenismo en el 100,0 %, tiempo de protrombina alargado en el 60,0 %, ascitis en el 20,0 %. No hubo complicaciones durante la intervención ni posterior a la cirugía, la permeabilidad de la derivación se evaluó mediante ecografía Doppler postoperatoria y tomografía abdominal. **Conclusión:** La derivación mesoportal instaura un enfoque curativo restaurando el flujo sanguíneo hepático. Esta técnica quirúrgica ha demostrado mejoría clínica significativa de la hipertensión portal incluyendo el sangrado de etiología variceal, hiperesplenismo e impacto en el estado nutricional.

PALABRAS CLAVE. Venas Umbilicales, Vena Porta, Hipertensión Portal, Hiperesplenismo, Várices Esofágicas y Gástricas, Derivación Porto sistémica Quirúrgica.

ABSTRACT

Background: Obstruction of the extrahepatic portal vein can occur with or without intrahepatic involvement, it is characterized by findings of recent thrombosis or Portal cavernomatosis. **Aim:** Evidence clinical manifestations, laboratory, and endoscopic changes of mesoportal shunt in children with obstruction of the extra hepatic portal vein. **Material and methods**. Retrospective case series, five patients with extra hepatic portal vein obstruction were included, the inclusion criteria were recurrent bleeding, endoscopic treatment failure and severe hypersplenism, children were excluded who could not perform this technique by compromise parenchyma in liver biopsy or vascular anatomical abnormalities. The study was conducted in a third level hospital in Mexico, the data were obtained from the clinical records. Statistical analysis was performed through the SPSS program version 23.0 at values with $p < 0.05$ were statistically significant. **Results:** Five patients are described, in the 100% with a history of prematurity, umbilical catheterization in newborn. In 100% esophageal, gastric varices and upper gastrointestinal bleeding prior to shunt, leukopenia, and lymphopenia 80%, thrombocytopenia and hypersplenism 100%, prolonged prothrombin time 60%, ascites 20% were identified. There were no complications during the intervention or after surgery, the permeability of the shunt was evaluated by postoperative Doppler ultrasound and abdominal CT. **Conclusion:** Mesoportal Shunt establishes a curative approach restoring hepatic blood flow. This surgical technique has demonstrated significant clinical improvement of portal hypertension including bleeding from variceal etiology, hypersplenism and impact on nutritional status.

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KEY WORDS: Umbilical Veins, Portal Vein, Hypertension, Portal, Hypersplenism, Esophageal and Gastric Varices, Portasystemic Shunt, Surgical.

INTRODUCTION

Extrahepatic portal vein obstruction known by its acronym in English (EHPVO) is the most common cause of extrahepatic portal hypertension in the pediatric population with a prevalence of up to 60% in developing countries compared to 20% in developed countries 1.It is operationally defined as partial or complete obstruction of portal vein flow with or without intrahepatic involvement, characterized by findings of recent thrombosis or portal cavernomatosis. 2 In children, umbilical catheterization and omphalitis are mentioned as the most common causes of EHPVO; however, the etiology can be divided based on local and systemic risk factors 1, 3. In the natural history of the disease it is mentioned that up to 70% of children attend pediatric emergency rooms due to upper gastrointestinal bleeding, the main clinical manifestation being before 10 years of age. The presence of esophageal varices has been reported in up to 95.0% and gastric varices in 40.0%. Among the diagnostic studies used we find: Blood chemistry evaluation, liver function tests, upper endoscopy, Doppler ultrasound, splenoportography, angiotomography and angioresonance 4. Over time, multiple therapeutic strategies have been established, including pharmacological management, variceal ligation and sclerotherapy. However, bleeding recurrences were observed in up to 30.0% during a 15-year follow-up. Surgical techniques include: portosystemic shunts, selective splenic embolizations, and curative techniques such as the mesoRex shunt are proposed 5-6.

OBJECTIVE: To determine the clinical and endoscopic characteristics before and after mesoportal shunting.

MATERIALS AND METHODS

A series of case was conducted in children with extrahepatic portal vein obstruction between the ages of 6 months and 16 years, treated in a tertiary hospital in the outpatient clinic and inpatient wards of the gastroenterology and pediatric surgery services of the New Civil Hospital of Guadalajara Dr. Juan I. Menchaca in a period of ten years in the period between 2008 and 2018, the inclusion criteria were recurrent bleeding, failure of endoscopic treatment and severe hypersplenism, the exclusion criteria were children with vascular anatomical alterations and parenchymal

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involvement in the liver biopsy, the research was approved by the Research and Ethics Committees of the host Hospital and written informed consent was obtained from those responsible for the patients, the information was collected from the review of the clinical records of the gastroenterology and pediatric surgery service of children who underwent mesoRex type portosystemic shunt. Demographic, clinical, biochemical variables, imaging studies, treatment before and after the shunt were analyzed. Statistical analysis for categorical variables used frequency and percentage, in quantitative variables averages and standard deviations were determined with the statistical program for social sciences (SPSS Statistics for Macintosh, Version 23.0. Armonk, NY: IBM Corp.)

Values with $p < 0.05$ were considered statistically significant. Bleeding recurrence, hypersplenism, endoscopic findings before and after the intervention, as well as changes in liver function and nutritional status were assessed. Approval was obtained from the Human Research Ethics Committee (HREC), and consent for participation was obtained.

RESULTS

Five patients with mesoRex shunt are described, 60.00% (3; 5) represented the female sex and 40.00% (2; 5) male sex, with a median age of 25 months (minimum 12 and maximum 36 months) all with a history of umbilical catheterization in the neonatal period.

As relevant history, two patients were premature and weighed less than 1500 grams, one with fetal macrosomia and the other with intrauterine growth restriction, neither with a previous surgical history.

All patients were admitted for upper gastrointestinal bleeding and in three patients the upper gastrointestinal bleeding was categorized as anemic with the requirement of blood products, one patient presented with ascites and in one patient his diagnosis was incidental since his reason for admission was carbamate poisoning. In 100.00% esophageal and gastric varices were identified, in 60.0% (3; 5) endoscopic findings of mild hypertensive gastropathy were observed such as the presence in the gastric mucosa of polygonal areas surrounded by a depressed light-colored border and in 40.0% (2; 5) and severe hypertensive gastropathy described as a mosaic pattern determined by the presence of cherry-red dots or spots "snake skin appearance" in the gastric mucosa. The five patients presented with upper gastrointestinal bleeding prior to Rex-type mesoportal shunt, an average of

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three episodes; four patients underwent endoscopic band ligation for an average of three to five sessions, and two patients underwent sclerotherapy with 2.5% ethanolamine Oleate, sessions performed at intervals of 1 to 2 weeks until obliteration was achieved; biochemical alterations were observed in all five children, 80.00% (4;5) with leukopenia and lymphopenia, 100.00% thrombocytopenia and hypersplenism, and 60.00% (3;5) with prolonged prothrombin time; ascites was observed in 20.00% (1;5); only one patient underwent splenoportography, where portal flow obstruction and diversion of contrast medium into the lower esophageal circulation were observed. Figure 1.

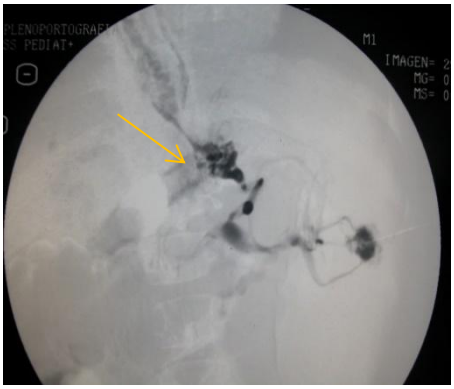

Figure 1: Splenoportography.
Source: Research database.
*Prepared by: Authors***.**

Figure 2. Chevron incision approach to shunting. Figure 3. The surgical technique involves shunting the extrahepatic portal vein obstruction with the placement of a vascular graft. Figure 4. The left external jugular vein was used as a graft between the superior mesenteric vein and the umbilical portion of the left portal vein system. Figure 5. After the intervention, graft reperfusion and hemostasis verification were evaluated.

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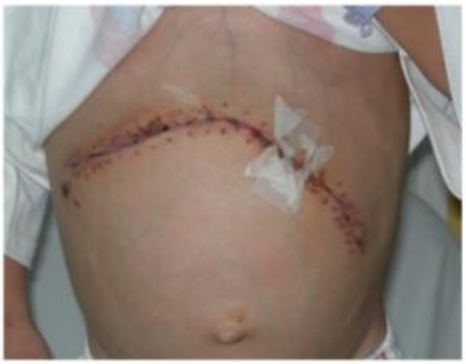

Figura 2: Incisión Chevron.
Fuente: Base de datos de la investigación.
Elaborado por: Autores.

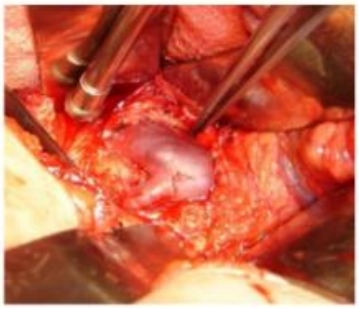

Figura 3: Disección de vena mesentérica y tributaria.
Fuente: Base de datos de la investigación.
Elaborado por: Autores.

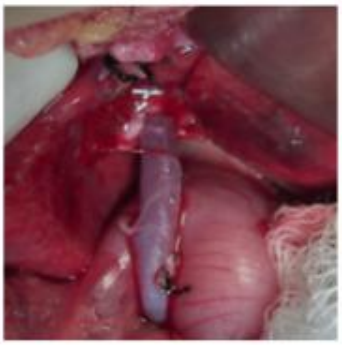

Figura 4: Colocación del injerto en receso de Rex.
Fuente: Base de datos de la investigación.
Elaborado por: Autores.

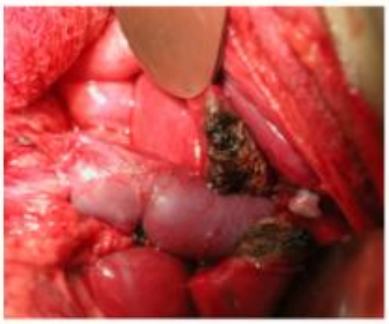

Figura 5: Reperfusión del injerto.
Fuente: Base de datos de la investigación.
Elaborado por: Autores.

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The time from diagnosis to surgery was 49.4 months, with a minimum of 24 months and a maximum of 72 months in the first patient.

There were no complications during or after surgery; shunt patency was assessed by postoperative Doppler ultrasound and abdominal CT.

Postoperative surveillance was performed at the first, third, sixth, and twelfth months during the first year, and every six months thereafter; Doppler ultrasound was performed during follow-up to assess spleen size, diameter, and shunt flow velocity.

Statistical analysis identified significant changes at 12 months of follow-up in the number of leukocytes, lymphocytes, and platelets, but not in the thromboplastin time. (Table 1)

Table 1. Biochemical values (mean and standard deviation) before and after 12 months of follow-up.

Variables	Before MesoRex	After MesoRex	p-value
Leukocytes (103 Cells/ul)	2.8± 1.7	5.4 ± 1.3	**0.003**
Lymphocytes (103 Cells/ul)	0.82 ± 0.6	1.7 ± 1.5	**0.001**
Platelets (103 Cells/ul)	34.8 ± 50.0	119.7 ± 12.1	**0.002**
Prothrombin Time (Seconds)	17.2 ± 1.4	14.7 ± 1.1	**0.089**

Source: Research database. Prepared by: Authors

Biochemical monitoring was performed in 100% of patients, including complete blood counts, coagulation times, total protein, differential protein, liver function tests, and blood chemistry, with a progressive decrease in hypersplenism and subsequent normalization. A concomitant nutritional assessment was performed, with significant improvement in percentiles. Medical treatment with beta-blockers was also progressively reduced according to each child's clinical and paraclinical progress.

DISCUSSION

There are multiple factors involved in EHPVO, within this framework we can classify them as local and systemic. Local factors include umbilical catheterization, omphalitis, liver abscess, necrotizing enterocolitis, surgical procedures, liver disease, and systemic factors such as thrombophilia and coagulopathy 1, 3, 7.

What is described in the literature regarding the pathophysiology is mentioned as a multifactorial entity where there are also other

manifestations associated with EHPVO that not only include variceal bleeding but also the adverse effects of the deviation of the portosystemic flow and metabolic alterations such as hypersplenism, failure to thrive, minimal hepatic dysfunction and encephalopathy 8,9.

Within this order of ideas, the presence of hypersplenism is common in up to 85%, liver function is preserved in most children, however up to 9% may present with elevated transaminases, alkaline phosphatase and gamma-glutamyl transpeptidase 10,11.

Over the years, treatment options for EHPVO include: conservative management with beta-blockers and therapeutic endoscopy to prevent variceal bleeding, portosystemic shunts, including selective distal splenorenal or nonselective mesocaval shunt, and restoration of portal blood flow with mesoRex shunt to decompress the portal system and restore portal venous flow 12.

Within this perspective, the therapeutic strategies used in adults cannot be extrapolated to children since the natural history of portal hypertension in children is different from adults, highlighting the use of beta blockers as primary and secondary prophylaxis of variceal bleeding in adults with cirrhosis is widely accepted, but it is not yet clear whether it can be administered routinely in children because studies in pediatrics are retrospective, small samples and with limited methodology 13. On the other hand, the conventional endoscopic techniques currently used correspond to ligation or sclerotherapy that although they are safe and effective in the pediatric population in our series recurrences of rebleeding were observed in 40% (2;5) in our series and there are reports where they mention between 17 and 44% so it is considered a tool to improve symptoms, even among children treated with endoscopic sclerotherapy after their first episode up to 25.0% will have bleeding before eradication of esophageal varices. The cumulative incidence of bleeding events reaches up to 30% during a 15-year follow-up. What has been reported in previous series is that variceal ligation, when compared with sclerotherapy, presented a lower recurrence rate, ranging up to 4% before complete variceal eradication. It should be noted that endoscopic findings of hypertensive gastropathy may be present, but, in contrast to adults, it is rarely a significant source of bleeding in children 14, 15.

The surgical technique used in patients with mesoRex shunt is classified as a curative measure since it achieves the restitution of portal flow through the shunt with favorable results described in children in England, the United States and Canada with a decrease in upper gastrointestinal bleeding in more than

95% of children. Similar figures in symptoms of hypersplenism and splenomegaly also contribute to affecting the quality of life since massive splenomegaly, biochemical alterations and hospitalizations limit school, social and sports activities 16, 17.

What has been demonstrated in recent years for the mesoRex technique is that by achieving the resolution or improvement of portal hypertension, its use has been proposed even in early stages with the aim of restoring the flow generated by the increase in pressure and flow velocity of the portal branches; due to the pathophysiology of EPHVO these children do not present with intrahepatic involvement; thus, if flow is restored, biochemical and endoscopic findings normalize in most patients, an effect that is not observed with portosystemic shunts 18 .

The type of shunt to be performed in children with EHPVO depends on the experience of the center, the technique used in our hospital mesoRex shunt is a porto-portal shunt and not porto-systemic like the rest of the shunts, the surgical anastomosis diverts the blood from the superior mesenteric vein to the left branch of the intrahepatic portal vein thus overcoming the obstacle of the thrombosed portal vein, being classified as a curative and effective measure that can be performed in more than 90% of children even under 2 years of age with a mortality > 1% 19,20,21,22 .

Although all three surgical strategies mentioned above have proven effective in preventing variceal bleeding, mesoRex shunt has been shown to be an effective measure in reversing failure to thrive as well as reversing coagulopathy and neurocognitive dysfunction, a recent study demonstrated an increase in prealbumin and insulin-like growth factor 1 (IGF-1) levels one year after surgery which led to an improvement in the nutritional status of children that is unrelated to caloric intake with a strong multifactorial association and related to reduced portal flow leading to reduced hepatotropic factors, malabsorption, early satiety due to massive splenomegaly, growth hormone resistance evidenced by high levels of growth hormone, decreased IGF-1 and insulin-like growth factor 3 (IGF-3) binding protein 23,24,25 .

CONCLUSIONS

The mesoRex shunt establishes a curative approach to OLVD by restoring hepatic blood flow. In this study, the shunt results were 100% successful. However, the sample size was very small. We can conclude that we observed clinical and biochemical improvement, reversal of endoscopic findings, and gain in weight, height, and muscle mass. The results of these studies suggest that refractory variceal

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bleeding is no longer the sole indication for surgical intervention. Although fully corrective, it should be considered early or when there are life-threatening esophageal varices where quality of life is limited by the risk of bleeding.

RECOMMENDATIONS

This study allowed us to observe clinical, biochemical, and endoscopic changes 12 months after the intervention. However, the sample size is small, but the results to date have been effective, with no immediate complications or mortality.

ABBREVIATIONS

EHPVO: Extrahepatic portal vein obstruction, MESOREX: Mesenteric-to-Left Portal Vein Rex Bypass, (IGF-1): Insulin-like growth factor 1, IGF-3: Insulin-like growth factor 3-binding protein, CEISH: Human Research Ethics Committee.

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