Laparotomy-assisted endoscopic closure of myelomeningocele: report of a single-centre experience in Paris, France VP51.03:

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Conclusions: The sonography of the posterior brain allows the identification of posterior fossa anomalies especially at the second trimester.

VP51: FETAL SPINA BIFIDA REPAIR

VP51.01

The "M" sign: systolic middle cerebral artery waveform changes before, during and after fetal myelomeningocele repair

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Objectives: Increased pulse wave reflection in the fetal arterial system, illustrated by a second systolic flow acceleration in middle cerebral artery (MCA) resulting in M-signed Doppler waveforms, allows interpretation of fetal systemic vasoconstriction. Accordingly, an M-sign in MCA Doppler waveform indicates significantly increased vasoconstriction. Little is known about fetal vascular regulation during fetal myelomenigocele (fMMC) repair. Therefore, the aim of this study was to analyse MCA-Doppler waveform changes before, during, and after fMMC repair.

Methods: 19 pregnant women who underwent fMMC repair were included. Fetal MCA-Doppler waveforms were prospectively analysed before, during and after fMMC repair, and categorised as follows: normal, systolic shoulder, second systolic peak (M-sign), and concave systolic downslope. These MCA waveforms were related to maternal and fetal characteristics and to anesthetic medication.

Results: Before fMMC repair, all fetuses repeatedly presented M-signs. After initiation of flurane for general anesthesia, systolic shoulder and M-sign vanished during fMMC repair, leading to normalised or concave systolic downslopes in 15/19 (79%) fetuses (binominal test, $p < 0.02$). This observation was independent from any other medication given under flurane anesthesia. After fMMC repair, signs of increased pulse wave reflection reappeared but resolved over time (27±20 days) in all fetuses. No significant association between the MCA Doppler changes and maternal or fetal characteristics was observed ($P = 0.7$).

Conclusions: Both fMMC with concomitant elevation of intracranial pressure as well as intrauterine repair influence fetal vascular regulation. This phenomenon can be illustrated by MCA-Doppler waveforms. While anesthetic agents transiently eliminated M-signs, the assumed sign of fetal vasoconstriction, fMMC repair finally led to normalisation of MCA-Doppler waveforms indicating return to normal fetal vascular regulation.

VP51.02

Outcomes of fetal microneurosurgery for intrauterine spina bifida repair in a country with a deficient health system

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Objectives: We describe our initial experience with fetal microneurosurgery and its effect on improving fetal survival, gestational age at delivery and reducing complications from surgery in a country with a suboptimal health system.

Methods: We selected a consecutive fetuses with confirmed spina bifida. Between November 2019 and November 2020, 12 singleton fetuses with confirmed lumbosacral open spina bifida, nine were selected for open fetal microneurosurgery as previously described by Dr. Rogelio Cruz Martinez group. The inclusion and exclusion criteria that are common for this surgery and already described by other authors were respected.

Results: The median gestational age at the moment to the surgery was 24.5 (range, 22.4–28) weeks. In all consecutive cases, fetal myeloplasty with a complete 3-layer correction was successfully performed. There were not any cases requiring conversion from microneurosurgery to the classic larger uterine incision. Nobody showed oligohydramnios, and PPROM 35 weeks GA showed in one case (11%), GA at birth greater than 36 weeks were 89 %. Admission to neonatal ICU due to neonatal prematurity in one case 11 % Interval between fetal intervention and delivery was 9.5 and 14.2 weeks. One patient (11 %) presented a raquisquisis larger than 3 * 3.5 cm, and the biological patch (Lyoplant Onlay) was used, whit a successful outcome. Nobody presented preterm delivery below 35 weeks and no presented perinatal death. All patients showed an intact hysterotomy site at delivery and there were no ultrasound signs of wound dehiscence. The average of the first obstetric surgical stage 25 min, neurosurgical time 57 min, second obstetric surgical stage 21 min.

Conclusions: This new microhysterotomy technique appears to improve perinatal outcome. Especially in countries where the health system offers poor care. Our results check that this modified uterine surgical by Dr. Cruz group, approach achieves significant improvement in rates of preterm delivery and achieve improvements in gestational age at delivery.

VP51.03

Laparotomy-assisted endoscopic closure of myelomeningocele: report of a single-centre experience in Paris, France

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Objectives: Given the morbidity of open surgery, prenatal fetoscopic repair is becoming the preferred first-line procedure for myelomeningocele (MMC). We hereby report the results from our centre, using a laparotomy-assisted CO2-fetoscopic approach.

Methods: This pilot study was conducted in patients with an MMC < T1 and > S1, < 26 weeks, with chiari malformation. All cases were assessed by MRI preoperatively. Fetoscopic repair was performed using two operating trocars following a transverse laparotomy for the exteriorisation of the uterus. Endoscopy was performed under CO2 insufflation. Following dissection of the lesion, a two-layer approach was performed with a muscle/skin flap sutured over a patch of Duragen. Main outcomes were the obtention of a watertight repair at birth and the need for postnatal neurosurgical surgery including shunting within six months.

Results: Of a total 107 women assessed for prenatal therapy over the study period, seven women were included. Surgery was performed at 24 (23–26) weeks. There were no fetal demises. Conversion to hysterotomy was not performed, although surgery could not be performed in one case because of fetal position. Severe pre-eclampsia developed postoperatively in one case requiring a Caesarean at 27 weeks, followed by neonatal demise. In the other five cases, follow-up was uneventful except for PPROM which occurred in 2/5 case. The average gestational age at delivery was 33 weeks. In 4/5 cases, repair was watertight at birth. In 1/5, CSF leakage required

one stitch at birth. Shunting was deemed necessary in one case. Regression of Chiari malformation was observed in 4/5 cases.

Conclusions: Laparotomy-assisted fetoscopic repair is a reasonable option for women that do not opt to terminate, both in terms of maternal and perinatal morbidity.

VP51.04
Options for intrauterine correction of spina bifida by open and fetoscopic fetal surgery: a systematic review

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Objectives: To describe the outcomes of fetal surgery techniques for intrauterine correction of spina bifida.

Methods: A search was performed in PubMed, Embase, Scope, Scielo y Google Scholar for all articles in English and Spanish published between January 1990 and March 2021 with the keywords: ''spina bifida'', ''fetal surgery'', ''spina bifida'', ''fetal surgery''. Studies including fetal interventions for intrauterine correction of spina bifida were selected and analysed.

Results: 694 articles were found in the literature; 11 articles described the results of fetal surgery cases with intrauterine correction of spina bifida. Two different fetal surgery techniques have been described for intrauterine spina bifida repair including open fetal surgery with 3 variants (classic technique with 6-8cm (centimetres) hysterotomy, 2.5-3.5cm mini-hysterectomy, and microneurosurgery with 1.5cm hysterotomy), and fetoscopic surgery with 2 variants (uterine exteriorisation by maternal laparotomy and the percutaneous approach). Open fetal microneurosurgery has shown the best perinatal outcomes with similar infant neurologic results.

Conclusions: Different variations on the classic original surgical technique. Open fetal microneurosurgery has the best perinatal outcomes.

VP51.05
Availability of fetal surgery for intrauterine correction of spina bifida in Mexico

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Objectives: To describe the availability of fetal surgery techniques for intrauterine correction of spina bifida in Mexico.

Methods: All specialists in Maternal Fetal Medicine were contacted by email through the Mexican Federation of Maternal Fetal Medicine and the Mexican Federation of Gynecology and Obstetrics to request information regarding the existence of fetal surgery programs, number of treated cases, and surgical techniques.

Results: Until March 2021, 90% of the centres offering this fetal surgery were private. Regarding open fetal surgery, the only public institution with this program is located in Querétaro, which is the only centre with overall experience of more than 10 consecutive procedures (Queretaro n = 80). Three new centres have recently started their open fetal surgery program (2 private centres in Guadalajara with 1 and 10 cases, respectively, and a private centre in Mexico City with 2 cases). Three more private centres in Sinaloa, Chiapas, Chihuahua, and two public centres in Leon and Mexico City have declared prepared to start their programs in 2021. Regarding fetoscopic repair, only two centres (Queretaro and Monterrey) have this research protocol with an initial experience of 2 and 14 cases, respectively.

Conclusions: Fetal surgery for intrauterine spina bifida repair is a reality in Mexico, which is now available in 5 centres in 4 cities and will be available in 5 further centres in 4 more cities. Although there are several centres in the planning phase, one Mexican centre has shown a great experience with 80 consecutive cases treated with open fetal surgery. Only 2 centres have the fetoscopic approach, but their experience is still limited.

VP52: FETAL THORACIC ANOMALIES (HYDROTHORAX, CDH AND CARDIAC INTERVENTIONS), LUTO AND LARGE FETAL MASSES

VP52.01
Fetoscopic prenatal diagnosis of esophageal atresia with tracheoesophageal fistula associated with congenital diaphragmatic hernia

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The association of congenital diaphragmatic hernia (CDH) with esophageal atresia (EA) is very rare. Prenatal suspicion might be of great help in organising immediate postnatal management. We report a case of a 27w fetus diagnosed with a severe left CDH, with liver herniation and an O/E LHR of 23%. The presence of polyhydramnios together with the difficulty to visualise the stomach raised the suspicion of EA. Genetic testing revealed normal CGH array and clinical exome. Since the CDH was classified as severe with an expected survival of 15%, a fetal endoscopic tracheal occlusion was offered to parents after multidisciplinary counselling. Fetoscopy performed at 31w showed the identification of 1) the proximal pouch by direct access to the esophagus and 2) a small defect in the upper posterior segment of the trachea (figure A). Both findings were consistent with the diagnosis of EA with tracheoesophageal fistula (TEF). Two weeks later, a second fetoscopy was performed to remove the balloon at 33.4w. During the procedure a 1 mm catheter was carefully inserted through the tracheal defect under combined endoscopic and ultrasonographic control. The instillation of 5 ml of saline solution made it possible to verify the distal filling and distension of the stomach (figure B) at the level of the thorax by ultrasound, confirming the diagnosis of distal TEF (type C, Gross classification). After delivery, the neonate underwent hernia surgery at 48 hours of age, and the TEF was closed. However, after several complications and entry into ECMO, the baby died at 10 days of life. To the best of our knowledge, this is the first report on a prenatal endoscopic assessment and characterisation of an EA/TEF combined with a CDH.

Supporting information can be found in the online version of this abstract