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# THE 17 YEARS OF EXPERIENCE IN INTRAUTERINE MYELOMENINGOCELE REPAIR IN FETAL SURGERY CENTER BYTOM POLAND

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**Introduction:** Myelomeningocele (MMC) is a severe congenital, non lethal neural tube defect. The estimated occurrence is in range of 2-6/10000 live births. MMC repairs done postnatally are unsatisfactory. The delay of the repair is associated with worsening of intrauterine neurological impairment due to progressive hydrocephalus and continuous exposure of spinal cord to amniotic fluid. Furthermore fetuses develop Chiari malformation type II, progressive hindbrain herniation and loss of motor function in the lower extremities, as well as neurogenic bladder and bowel dysfunction. The long term and multicenter clinical experience worldwide has proven efficacy and validity of intrauterine MMC repair (IUMR) by OFS. Due to possible maternal complications, this method is still being improved. **Fetal Surgery Center in Bytom (FSCB)**, has been conducting IUMR since 2005. Our experience includes interventions of both OFS and hybrid fetoscopic methods in a total number of over 190 interventions.

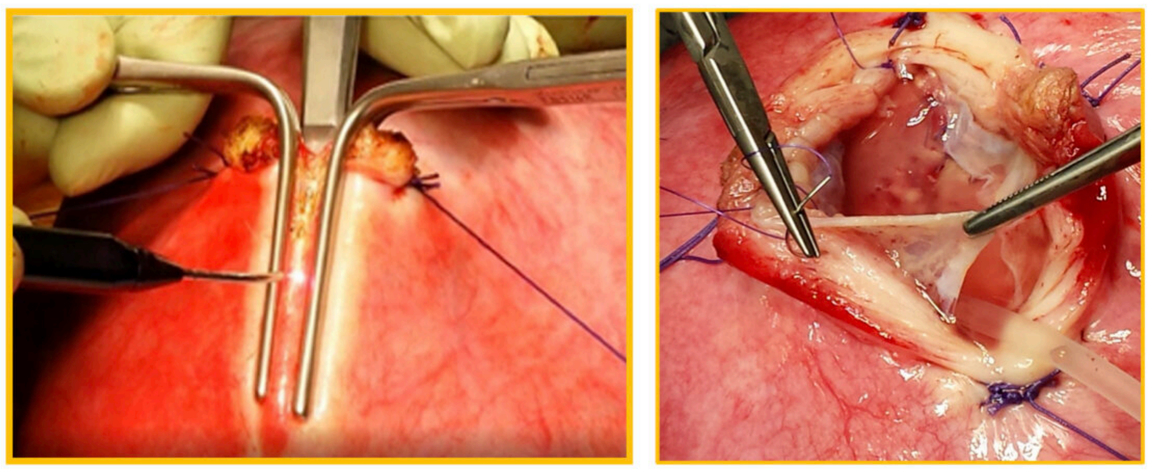

**Figure 1. Hysterotomy without uterine stapler**

## Aim

Presentation of the current protocol of the IUMR (CPI) technique and maternal-fetal results

## Material and methods

The implementation of CPI is carried without the use of an automatic uterine stapler and the use of magnesium sulfuricum, by manual hysterotomy and hysterorhaphy. 64 OFS performed with CPI in years 2015 – 2020 at FSCB, compared and analyzed vs. the retrospective cohort (RC; N=46) and data from the Zurich Center for Fetal Diagnosis and Therapy (ZCFDT; N=40) and the Children's Hospital of Philadelphia (CHOP; N=100) - all using traditional tocolysis and staplers.

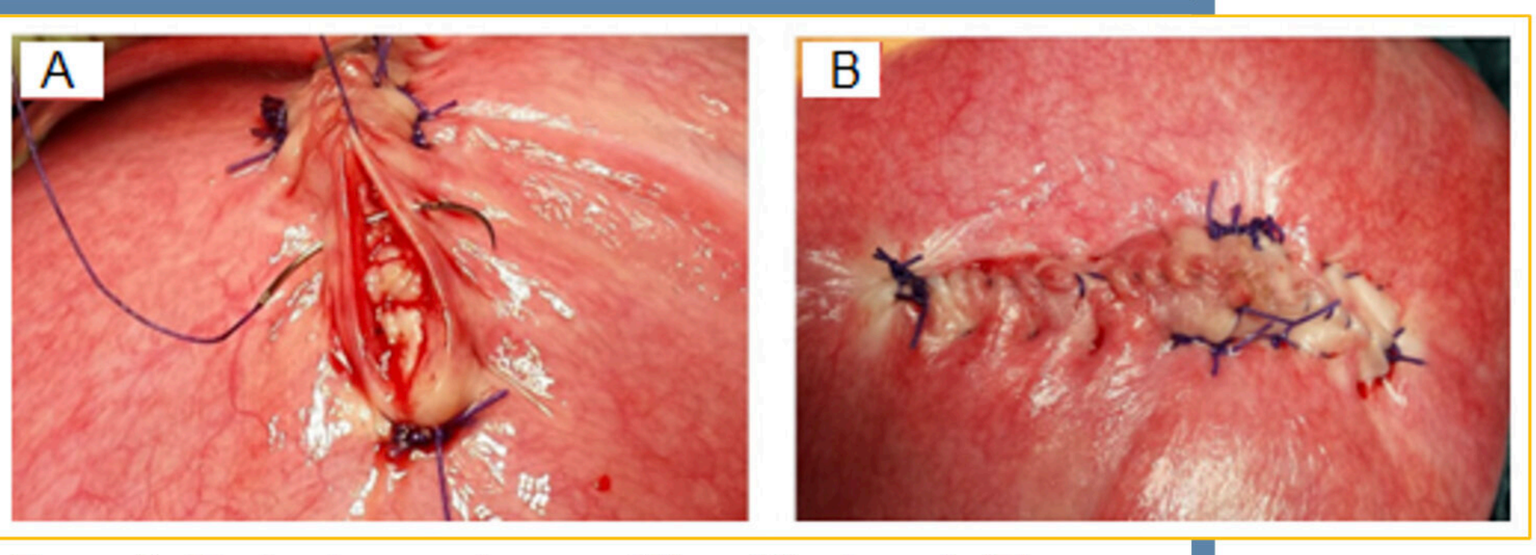


**Figure 2. Closing layers of uterus (A) and final result (B)**

## Results

Clavien-Dindo classification (C-Dc) was used to asses maternal complications. None of the newborns was delivered before 30 GA. Only 2 women presented grade 3 complications and none presented 4th or 5th grade (C-Dc). The incidence of perinatal death (3.3%) was comparable with RC (4.3%) and CHOP (6.1%).

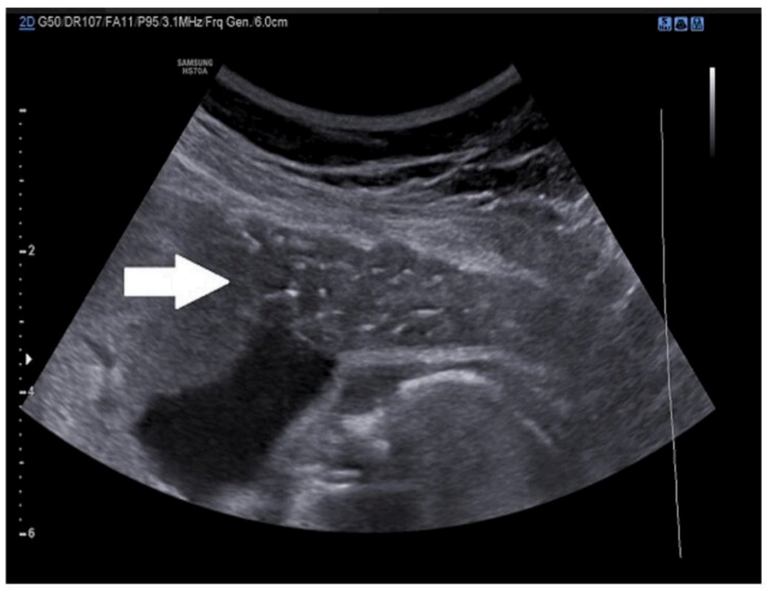


**Figure 3. Ultrasound scan of sutured myometrium**

**Figure 4. Post OFS suturing scar at the time of c-section**

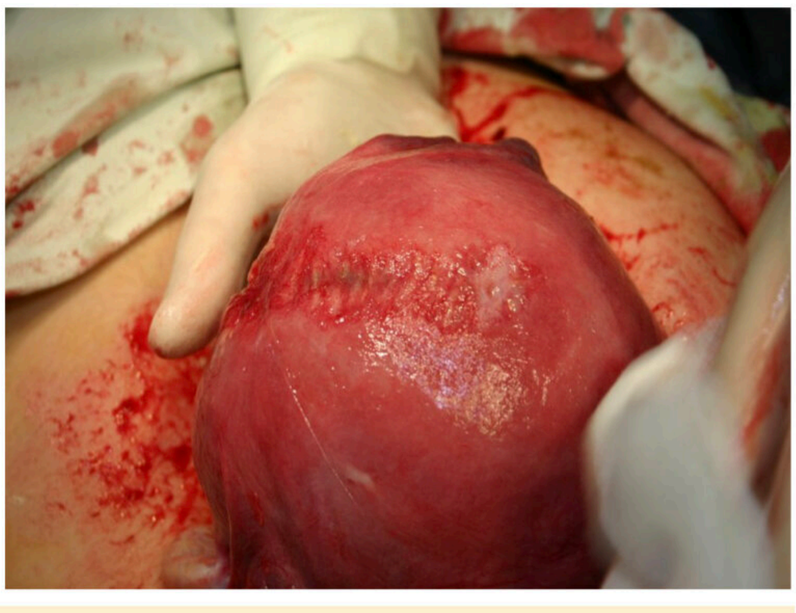

**Table 1.** Comparison of operative and perinatal complications according to the Clavien-Dindo classification in all cohorts.

| | Study Cohort FSCB $n$ = 58/60 | Retrospective Cohort FSCB $n$ = 44/46 | ZCFDT $n$ = 40 | Post-MOMS (CHOP) $n$ = 100/98 |
|---|---|---|---|---|
| *Grade 1—mild complications not requiring any pharmacological treatment or surgical intervention* | | | | |
| Gestational diabetes (nutritional therapy) | 2 (3.3) | 1 (2.2) | 6 (15) * | |
| Seroma | 4 (6.6) | NA | 10 (25) * | NA |
| Hematoma | 0 | 1 (2.2) | 3 (7.5) * | |
| Wound dehiscence (skin) | 2 (3.3) | 1 (2.2) | 2 (5) | |
| Symptoms of subileus (nausea/flatulence) | 1 (1.7) | 0 | 0 | |
| Symptomatic cholecystolithiasis (analgesics only) | 0 | 0 | 1 (2.5) | |
| Transient amniotic fluid leakage | 1 (1.7) | 3 (6.5) | 4 (10) | |
| CAS | 4 (6.8) | 8 (17.3) | 12 (30) ** | 22/96 (22.9) * |
| *Grade 2—complications requiring pharmacological treatment* | | | | |
| Gestational diabetes type 1 | 0 | 0 | 2 (5) | NA |
| Pulmonary edema (no intubation) | 0 | 1 (2.1) | 0 | 2 (2) |
| Pregnancy-induced hypertension | 1 (1.7) | 0 | 0 | 0 |
| Urinary tract infection | 1 (1.7) | 1 (2.1) | 0 | |
| Cholestasis of pregnancy | 0 | 0 | 1 (2.5) | NA |
| Thrombotic disease | 1 (1.7) | 0 | 0 | |
| Blood transfusion | 1 (1.7) | 3 (6.5) | 0 | 8 (8.8) |
| Oligohydramnios (AFI < 5 cm) | 7/58 (12) | 4 (8.7) | NA | 6/96 (6.3) |
| Tocolytic treatment for uterine contractility (intra or post fMMC repair) | | | | |
| Beta$_2$ mimetic | 1 (1.7) | 40 (87) *** | 0 | NA |
| Atosiban | 10 (16.6) | NA | 25 (62.5) *** | NA |
| Magnesium sulfate | 4 (6.6) | 23 (50) *** | 15 (37.5) *** | 100 *** |
| Hexoprenaline | 0 | 0 | NA | 0 |
| Nifedipine p.o. | 60 (100) | 38 (82.6) ** | 40 (100) | 100 |
| COX-1/2 inhibitors | 60 (100) | 40 (87) ** | 40 (100) | 100 |
| PROM | 11/58 (19) | 24 (52.2) ** | 14 (35) | 31/96 (32.3) |
| Spontaneous contractions of the uterine muscle <37$^{+0}$ weeks | 10/58 (17.2) | 26 (56.5) *** | NA | 36/96 (37.5) ** |
| *Grade 3—complications requiring surgical intervention* | | | | |
| Peritonitis | 0 | 1 (2.2) | 0 | 0 |
| Seroma (requiring surgical intervention) | 0 | 0 | 2 (5) | NA |
| Hematoma (requiring surgical intervention) | 1 (1.7) | 0 | 0 | |
| Cholecystolithiasis (requiring surgical intervention) | 0 | 0 | 1 (2.5) | 0 |
| Pre-eclampsia/Eclampsia | 0 | 2 (4.3) | 1 (2.5) | 1 (1) |
| Chorioamnionitis (not requiring IC/ICU management) | 0 | 2 (4.3) | 1 (2.5) | 4 (4) |
| Incisional hernia | 0 | 0 | 1 (2.5) | 0 |
| Bartholin's cyst | 0 | 0 | 1 (2.5) | 0 |
| Placental abruption | 1 (1.7) | 2 (4.3) | 4 (10) | 6 (6.6) |
| Major bleeding (extragenital) | 1 (1.7) | 2 (4.3) | 1 (2.5) | 0 |
| Uterine rupture/Fetal extrusion into the peritoneal cavity | 0 | 1 (2.2) | 0 | 0 |
| *Grade 4—life-threatening complications requiring IC/ICU management* | | | | |
| Third-degree AV block with mechanical reanimation/other acute heart disease | 0 | 0 | 1 (2.5) | 0 |
| Lung embolism | 0 | 0 | 1 (2.5) | 0 |
| Urosepsis | 0 | 0 | 0 | 0 |
| Pulmonary edema (with intubation) | 0 | 0 | 1 (2.5) | 0 |
| Uterine rupture | 0 | 0 | 1 (2.5) | 0 |
| Chorioamnionitis | 0 | 0 | 1 (2.5) | 0 |
| *Grade 5—maternal death* | 0 | 0 | 0 | 0 |

Statistical significance vs. Study Cohort (* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$). Abbreviations: CAS—Chorioamniotic membrane separation; AFI—amniotic fluid index; PROM—premature rupture of membranes; IC—intensive care; ICU—intensive care unit; AV—atrio-ventricular.

Grade 1 complications were found in 11 (18.3%) patients with at least 1 or 2 mild complications. Grade 2 complications resulting from MMC repair were statistically significantly less common in the SC than in the ZCFDT and CHOP cohorts—oligohydramnios was

## Conclusion

CPI resulted in a significant reduction of major perinatal complications, and reduction of perioperative tocolysis (16.6% in SC vs 62.5% in ZCFDT).